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MARCH-APRIL 1977

FIRE TECHNOLOGY ABSTRACTS

U.S. DEPARTMENT OF COMMERCE
National Fire Prevention
and Control Administration

NOTE . . .

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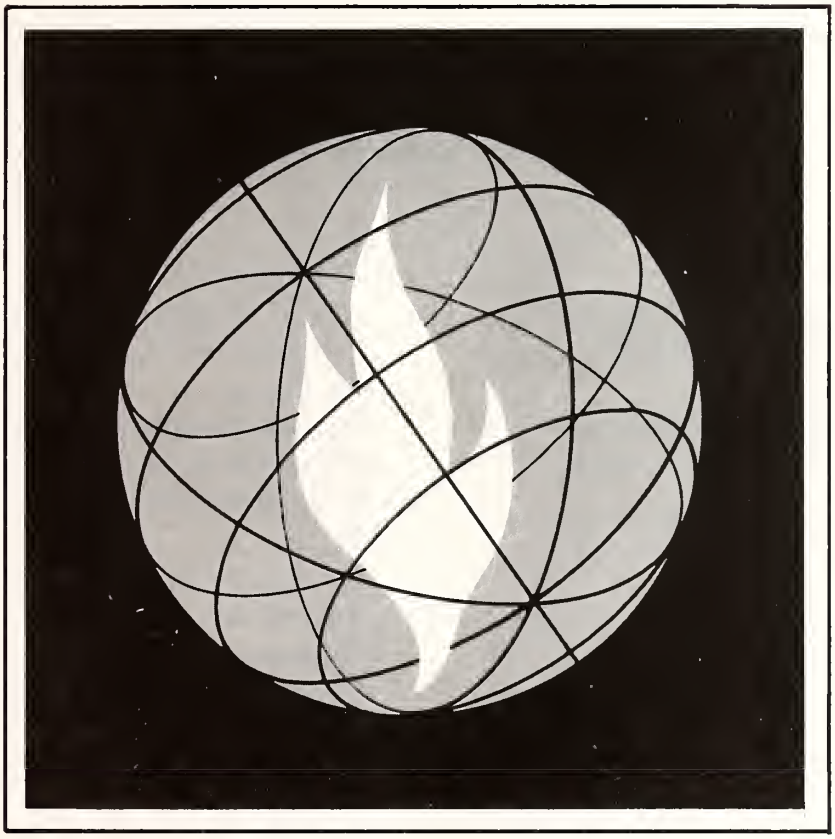
FIRE TECHNOLOGY ABSTRACTS



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FIRE TECHNOLOGY ABSTRACTS

Fire Technology Abstracts is an abstracts journal being prepared bimonthly by the Fire Problems Program Group of the Applied Physics Laboratory of the Johns Hopkins University, Laurel, Maryland, USA, under the sponsorship of the National Fire Prevention and Control Administration (NFPCA) of the US Department of Commerce.

SCOPE AND COVERAGE

The aim of **Fire Technology Abstracts** is to provide comprehensive reference to the applied fire literature in the broad range of topics outlind in the "Table of Contents." Most topics are covered fully; a few topics, such as forest fires and mine fires, are referenced selectively, because they are coverered systematically in other specialized indexing and abstracting serials. For such topics an appropriate notice has been entered under the respective category.

The information contained in **Fire Technology Abstracts** has been gleaned from a wide variety of sources (journals, books, reports, patents, codes, and standards), with particular emphasis on the report and patent literature, for which referencing heretofore has been inadequate. Although the English-language literature comprises the majority of the entries, the coverage includes selections from the world fire literature, identified in part through such sources as *Safety in Mines Abstracts* of the Safety in Mines Research Establishment (UK), identified in the abstracts as (SMRE), the Soviet *Abstracts Journal,* Series 68, "Fire Protection," identified as (RZh), and the card abstracts issued monthly by the Fire Literature Documentation Section of the German Fire Technology Research Center at the University of Karlsruhe, identified as (Fachdok).

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ARRANGEMENT

The journal is arranged in two sections: Abstracts and Indexes.

The Abstracts section contains the complete bibliographic description required for retrieval of each item, along with a brief description of the contents of the item, usually consisting of the author's abstract, summary, or conclusions. The patents entries contain, in addition, citations of the patent classes, in most cases in accordance with the international classification system, in some cases preceded by classes according to a national classification scheme, as well as filing and disclosure dates, priorities, and, if available, assignees. The abstracts are classified under the 13 main categories listed in the "Table of Contents" and a suitable number of subcategories.

The Index section consists of four indexes: author, subject, source, and report number. Each entry in each index is keyed to an abstract number. Annual cumulative indexes will be published.

The Author Index is an alphabetical list of all authors cited in the abstracts section, including both principal or secondary authors.

The Subject Index entries consist of up to three hierarchic descriptive levels to clearly identify the subject content.

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The Report Number Index lists in alphabetical order the numbers of all the reports entered in each issue, including multiple numbers, as well as the accession numbers under which reports are available from document repositories.

These indexes (as indeed the entire journal) are composed and printed out by an IBM 360/91 computer, using the INFO-360 Document Writing Package of programs developed at the Applied Physics Laboratory. All but the subject index are produced directly from the printed portion of the entries. The subject index terms are typed in at the end of the abstracts, but are not printed in the body of the journal. Author affiliations, whenever available, are also included in the records. These are not printed or listed, but are reserved for future use in developing directories and the like.

AVAILABILITY

Fire Technology Abstracts is a literature announcement service only and cannot respond to requests for the documents announced in the journal. For all literature citations an effort is made to provide the information needed by the reader to acquire the document. In general, however, the full text of many of the journal articles cited in **FTA** can be purchased through the Original Article Tear Sheet service (registered tradename OATS) of the Institute for Scientific Information (registered ISI) in Philadelphia, PA. The full text of those abstracts terminating with (Fachdok plus numbers) can be purchased by citing the number and ordering from the Documentation Center of the German Fire Technology Research Center in Karlsruhe, FRG. The addresses of these two organizations are given below.

For books, monographs, conference papers, and proceedings the source is, in most cases, either the publisher or the sponsoring organization.

Dissertations are available in xerographic copy from University Microfilms of Ann Arbor, Michigan.

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US Reports are available for a fee from the National Technical Information Service (NTIS) or from the US Government Printing Office (GPO). If availability is not indicated, the issuing organization should be queried.

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FIRE TECHNOLOGY ABSTRACTS

Volume 1, Number 5 March-April 1977

1. GENERAL

a. FIRE PROTECTION ORGANIZATION

1508. Anon
WHAT'S AHEAD FOR THE NFPCA?
Fire Chief; 21(1):38-50, 1977

The National Fire Prevention and Control Administration (NFPCA) has been in operation for just over two years. Three articles are designed to help the reader learn more about the NFPCA: what it has accomplished so far, a forecast of expectations for the future, and who the people are who are planning and developing the programs. There are interviews with the administrator, Howard Tipton, and with the National Fire Prevention and Control Academy superintendant, David McCormack. In addition, several of the other top NFPCA officials have provided brief statements about the projects in their particular area of concern and their hopes for the future.

1509. Anon
EXPERTS AS CLOSE AS YOUR TELEPHONE
Fire Command; 43(11):28-30, 1976

The services offered by the NFPA's Public Protection Division with, currently, a four-man professional staff, each member a specialist in one aspect of fire-department operations, are outlined. A primary function is advisory service. Another major activity is the role played in formulating NFPA standards relating to fire departments. The division is also active in assembling and administering seminars directed to fire service members. The functions and activities are discussed. 4 photos.

1510. Colcord HN
THE FEDERAL APPROACH TO FIRE PREVENTION
Fire Command; 43(12):18-21, 1976

The four major areas of activities of the National Fire Prevention and Control Administration carried out by the four major divisions of the National Fire Data Center, the National Academy for Fire Prevention and Control, the Public Education Office, and the Fire Safety Planning, Research, and Technology Office are described.

1511. Rusilier R
FIREFIGHTERS ASSOCIATION
Prot Civ Secur Ind; (252):6-18, 1976 (French)

The history of the foundation, the organization and activity of the Firefighters Association in France are described. The active members of the Association are, as a rule, professional personnel of the fire service units, while honorary members may be former firefighters and persons assisting in fire service activities. Any employee of the fire service may be a member of the Association, but purely on a voluntary basis. The rights and duties of Association members are discussed.

1512. Mingenbach H
ORGANIZATION OF FIRE PROTECTION IN FACTORIES
Werkfeuerverband eV. Rundschreiben; (93/94):1-20, 1976 (German)

The purpose and tasks of industrial fire brigades are discussed in the circular. A number of laws, ordinances and guidelines that form the legal underpinning for the existence of industrial brigades are enumerated and explained, as well as the prerequisites for recognition as an industrial fire brigade. The strength and equipment of the brigade must be adapted to the risk of the plant (determination of the risk for rational planning of fire protection). The disposition of fire-fighting personnel, whether as principal occupation or voluntary, depends on the type and size of the plant. The recommendation of the workplace guideline (ASR 13/1.2) is mentioned for equipping the brigade with fire extinguishers. Indispensable prerequisites for effective plant protection are the establishment of a fire-protection regulation and alarm plans. (Fachdok 13/0269)

b. MEETINGS AND PROFESSIONAL ACTIVITIES

1513. Gihl M
THE 1976 CTIF CONFERENCE AND SYMPOSIUM IN BERLIN
Brandschutz; 30(11):296-299, 1976 (German)

An appreciation of the excellent work done by the Berlin Fire Department in organizing and hosting the 1976 CTIF (Comite Technique International de Prevention et d'Extinction du Feu) conference is followed by a report on the conference, which was the occasion for other meetings as well. A short section is devoted to the work of the executive committee and the permanent council of the CTIF. The contents of the technical papers are given in the form of abstracts. The topics of the papers are as follows: Preventive Fire Protection in High-Rack Warehouses; Recent Findings in the Field of Development of Foams and Wetting Agents; Fire Fighting with Dry Powder and Halon; Basic Requirements for All-Purpose Fire Apparatus and Their Tactical Use; and Information on Reporting Techniques in Fire Protection. 3 figs. (Fachdok 13/0144)

1. GENERAL

b. Meetings and Professional Activities—Continued

1514. Anchor RD
FIRE RESISTANCE
Concrete; 10(1):31, 1976

A report is made on a conference on the problems of fire resistance held by the Midlands Branch (UK) of the Institution of Structural Engineers at Aston University. The symposium opened with an historical review of the evolution of fireproof factories, followed by a discussion of the history of regulations controlling statutory fire protection. The classification of buildings into three types of construction was presented and the distinction between specified periods of fire resistance which satisfy the statutory requirements and the attitude of insurers was defined. Methods of fire protection in Rumania were described, as were the furnaces and test procedures. Papers were also presented on fire protection and the structural engineers, fire resistance tests and an economic appraisal, fire resistance of concrete structures, aspects of building regulations, rational design, fire resistance of structural steelwork and of load-bearing masonry.

1515. Anon
HOME OFFICE HOLD TWO-DAY OPERATIONAL STUDY ON SHIP FIRE-FIGHTING
Fire Prot Rev; 39(428):308-309, 1976

A two-day operational study on ship fire-fighting and port hazards was held by the Home Office Fire Department (UK) at the Fire Service Technical College, Moreton-in-Marsh, on May 25 and 26, to provide an opportunity for discussion between the Fire Service and port and shipping interests of the problems associated with fire-fighting in ships and port installations, particularly in view of recent developments in ships and port construction, and in the interest of fostering a continuing dialogue in the future. Following the introductory address on the broad picture of the situation as seen by the Fire Service, eight papers were read, to wit: Current Developments (see *FTA* 1(3), abstract 1043); Operational Fire-Fighting Tactics Used on Passenger Vessels, with Brief Reference to Container Vessels; Fires in Cargo Ships and the Need and Effectiveness of Pre-Planning Arrangements; Dangerous Substances in Relation to Ships and Port Areas; Fire-Fighting Problems on Oil Jetties; Fire Prevention in Ships in Port and Under Repair (see abstract 949, *FTA* 1(3)); Fire Training of Merchant Navy Personnel; and Ship Fire-Fighting Training Courses (see abstract 962, *FTA* 1(3)).

c. LITERATURE AND NOTICES

1516. Jensen R (Ed)
FIRE PROTECTION FOR THE DESIGN PROFESSIONAL
PE Cahners Books, Boston, MA; 198 pages, 1976

An anthology with contributions from 20 fire-protection engineers, this book is written for architects, builders and engineers who must keep abreast of the growth of fire protection technology. Six chapters provide information on United States codes and standard systems. Another section of the book discusses fire protection systems using water or water additives. Other chapters concern special agent systems, extinguishers, HVAC systems, and fire alarm systems and other electrical fire-protection systems.

1517. Kuvshinoff BW (Ed)
FIRE SCIENCES DICTIONARY
John Wiley and Sons, New York, NY; 1st edit, 439 pages, 1977

This interdisciplinary dictionary of almost 10,000 fire-related terms, derived from the documents and research of dozens of experts and from 75 distinct science and technology fields, provides a general source of information for specialists and laymen alike. Not only a vocabulary aid for fire science students, it also facilitates communication and understanding among the various specialists within the fire services and the fire research community. It is intended to encourage cross-disciplinary readings in fire science literature by enabling scientists, engineers, technicians, and firefighters to understand each other better. In addition to American terms, many are drawn from British and Canadian sources to help readers with regional differences in terminology. (Author)

1518. Aresu de Seui H
THESAURUS OF FIRE PROTECTION ENGINEERING TERMS
Belgian Fire Prot Assoc, Brussels, Belgium; 1st edit, 23 pages, Jun 1976

This publication is the first edition of a thesaurus of keywords devoted to fire protection engineering. It was initiated in response to a growing demand in the fire protection engineering profession resulting from an exponential increase in technical information. The traditional methods of handling such information concentrated largely on the archival function and too little on the capacity to retrieve information rapidly. The objective was to produce a comprehensive thesaurus of scientific and technical terms for use as a basic reference in information storage and retrieval systems and to provide a vocabulary groundwork by means of which the interchange of information might be enhanced. Some other publications and one engineering and scientific thesaurus were consulted in gathering terminology. The basic classification of the keywords corresponds closely to the 22 major fields in the COSATI (Federal Council for Science and Technology) index. A glossary of equivalent terms in French and Dutch is presently being prepared.

1519. Gaskill JR
COORDINATION OF FIRE TERMINOLOGY IN ASTM.
Univ of California (Livermore), Lawrence Livermore Lab; CONF-760822-2, 5 pages, Jan 1976
Availability: NTIS UCRL-78327

The American Society for Testing and Materials (ASTM) has in its various standards and testing committees subcommittees whose function is the development of appropriate terminology associated with these standards and test methods. Terminology in the field of fire technology is presented. (This paper was presented at the US ERDA Air Cleaning Conference held at Sun Valley, Idaho, on 2 August 1976.)

d. FIRE AND EXPLOSION INCIDENT CRITIQUES AND ANALYSES

1520. Perel A, Mahler Y and Davidson JT
COMBUSTION OF A NASAL CATHETER CARRYING OXYGEN
Anesthesiol; 45(6):666-667, 1976

The occasional occurrence of fires and explosions associated with flammable anesthetics is well documented. The essential ingredients for such accidents are the presence of an explosive mixture and a source of energy sufficiently powerful to cause ignition. In the hospital situation the main potential source for ignition is electrosurgical equipment and static electricity. The case described here involved an oxygen-carrying nasal catheter that caught fire under circumstances in which there appeared to be no danger. 2 figs, 10 refs. (Author)

1521. Anon
MAJOR FIRE DAMAGE AFTER ELECTRICAL THAWING
Brandverhuetung; (115):8, 1976 (German)

A 5.5 m segment of water pipe was heated by a voltage of 7 V at a current of 285 amps from a step-down transformer connected to a 220 V a-c net (2 KW net capacity) for 0.5 hours. After removing the heat, a fire broke out in 30 min at the spot where the pipe passed through a straw-filled enclosure. A connecting sleeve with an oakum-sealed thread was located on the pipe at this point. The electrical resistance of the threaded joint turned out to be so great that the coupling was heated by the current to a temperature of 350-400°C and became an ignition source. The fire losses amounted to 750,000 Austrian schillings. 1 fig.

1522. Malara J, Kukuczka A and Student Z
METHODS AND MEANS FOR SUPPRESSION OF AN UNDERGROUND FIRE IN A MINE SECTION WITH STRONG EVOLUTION OF METHANE IN THE MANIFEST LIPCOWY MINE
Wiad Gorn; 27(2):33-37, 1976 (Polish)

The process of extinguishing an underground fire that broke out in the Manifest Lipcowy mine (Poland) in April 1975 in the driving head of the belt conveyor system is described. Active efforts to extinguish the fire were complicated by an inadequate water head in the water pipes due to burnup of the gaskets, by collapse of the mine workings and rapid spread of the fire along the belt. Isolation of the fire section would have resulted in possible explosion owing to the strong evolution of methane. On the request of Polish specialists, therefore, a team of Soviet specialists was sent to the mine with a GIG-4 inert gas generator, which neutralized the gas in the fire section and isolated this section. The individual steps of the fire suppression operations are analyzed. 1 fig. (RZh)

1523. Berman GA
DARE YOU WATCH COLOR TV WITHOUT A FIRE EXTINGUISHER
Reliability and Maintainability Symp, Annual, 1975, Proc; 1975, Jan 28-30, Washington, DC, pages 528-530
Sponsor: IEEE

On the basis of examination of a case history of a fire in a particular model receiver, the author discusses the incidence of fires in television receivers, especially color sets, and industry response to the hazard. The author suggests that the increased use of solid-state devices will increase fire safety, but that older sets should not be left unattended. 5 figs, 4 refs.

e. FIRE SCIENCE EDUCATION

1524. Smirnov A
COURSES AT THE ADVANCED FIRE-TECHNOLOGY ACADEMY
Pozhar delo; (8):14, 1976 (Russian)

Special series of courses are offered at the Advanced Fire Technology Engineering Academy of the USSR to round out the education of officers and officials of the fire service. Subjects in the fields of administration, labor organization, information technology, and fire prevention in cities, industrial plants and agricultural collectives are taught in these courses. Typical and instructive fire incidents are also analyzed during the courses; practical experiences are exchanged; network planning, maintenance and reliability of firefighting equipment and extinguishants are also subjects taught in these courses. 1 fig. (Fachdok 13/0236)

f. LEGISLATION

1525. Anon
LAW ON THE PREVENTION OF ACCIDENTS IN PETROLEUM PLANTS
Aromatikkusu; 28(2):3-4, 1976 (Japanese)

The principal articles of the new Japanese law on the prevention of explosions and fires in petroleum plants, which was passed in 1975 and became effective on January 1, 1976, are presented. The articles regulate primarily organizational aspects: the organization of the fire safety service and the distribution of responsibilities among the personnel of these services and the administrative staff of petroleum factories to implement the regulative measures. An example of analysis of the causes and effects of a gas explosion at one of the plants in Japan is cited, taking into account the articles of the new law. It is noted that only state-run petrochemical enterprises are covered by this law because of the specific nature of the system of organizing supervision of the activities of private companies.

1526. Zeilmayr A
THRILL SEEKING — LEGAL CONSEQUENCES
Brand aus; 84(11):445-447, 1976 (German)

The questionable behavior of curious and thrill-seeking passers-by when there are accidents and harmful events of all kinds has led in Austria to the promulgation of various ordinances and laws. In a decree dated March 3, 1967, the state government of Upper Austria urged the local communities to confront this abuse in fire incidents and published a model for a "fire scene ordinance." In accordance with paragraph 2 of the Upper Austrian Fire and Police Ordinance the local communities are also obliged to remove obstacles to firefighting. Paragraph 187 of the new penal code, "Hindering the Fighting of a Public Danger," introduces a new penal offense, thus creating a new tool for preventing interference in major responses on the part of the fire department and rescue organizations. The text of this law is clarified in this article. 1 fig. (Fachdok 13/0244)

1527. Haendel K
MISUSE OF EMERGENCY ALARMS AND IMPAIRMENT OF ACCIDENT PREVENTION FACILITIES
Brandwacht; 31(9):167-170, 1976 (German)

Introduction of the new section 145 of the Penal Code (FRG) at the beginning of 1975 has put an end to the former highly unsatisfactory legal situation with respect to the punishment of such felonies. Paragraph 1 contains: 1) the deliberate or willful misuse of emergency alarms; and 2) pretending it is necessary to require assistance because of an accident or common hazard. Paragraph 2 covers the facts of the case of deliberate or willful removal or damaging of 1) warning signs or restricting signs and 2) protective facilities or rescue devices. Information is given on when and in what cases the facts of section 145 of the Penal Code, paragraphs 1, Nos. 1 and 2, and paragraph 2, Nos. 1 and 2, are fulfilled and the relationship between this section and other legal regulations. (Fachdok 13/0012)

1528. Belkin NL
FABRIC FLAMMABILITY LEGISLATION: WHAT IT MEANS TO HOSPITALS
Hosp Top; 54(5):21-22,24, 1976

In view of the role that fabrics play in fire situations in hospitals with their vast quantities of highly combustible materials and oxygen-enriched atmosphere, the state-of-the-art in fabric flammability legislation and the advancement of technology in flame-resistant fabrics are reviewed. 8 refs.

1529. Anon
LAW ON THE PREVENTION OF ACCIDENTS IN PETROLEUM PLANTS
Ryusan to kogyo; 29(2):37-40, 1976 (Japanese)

Some organizational aspects of implementing those sections of Japanese legislation connected with occupational safety and the prevention of accidents in the oil-processing and petrochemical industry are clarified. The following principal sections are dealt with in this legislation: general aspects of occupational safety; organization of the occupational safety service; analysis of labor conditions; special technical aspects of occupational safety, such as protection against the effects of toxic and radioactive materials, industrial noise and vibrations, and adverse meteorological conditions; the development of safe technology; increasing the reliability and safety of machines, mechanisms, tools, etc; fire prevention – the prevention and extinguishment of fires; the avoidance and attenuation of explosions. A brief description is given of the national system of administrative organizations charged with implementing the law on prevention of accidents in these branches of industry in Japan. Some statistical data characterizing the number of accidents, including fires and explosions, in 1975 are cited. It is noted that about 1,600 fires and explosive situations were registered in the narrowly specialized ethylene plants alone in 1975. (RZh)

1530. Quarch fnu
FIRE DEPARTMENT AND SAFETY SPECIALISTS — PARTNERS IN PREVENTING LOSSES IN FACTORIES
Werkfeuerverband eV. Rundschreiben; (93/94):28-33, 1976 (German)

The requirements for safety specialists are prescribed for the first time in paragraph 7 of the occupational safety law (A Si G) of the FRG (in force since December 1, 1974), and the proof of expertise required in the safety engineering field is specified in paragraph 3 of the accident prevention regulation (UVV) entitled "Safety Engineers and other Specialists for Occupational Safety." The subjects treated in this article are the practical implications of these laws in the factory, the responsibilities and powers of the safety specialists, their cooperation with the workmen's council, the safety manager and various internal and external committees, and the different possibilities for reaching the goal of occupational safety. It is argued that the tasks and goals of occupational protection and the fire service run in parallel lines. (Fachdok 13/0222)

1531. Anon
TRANSPORTATION OF HAZARDOUS MATERIALS BY AIR. Committee on Govt Operations; GPO 62-325, 96 pages, 1976
Availability: GPO

In a hearing before a subcommittee of the Committee on Government Operations, 94th Congress, 1st Session, 8 October 1975, legislation enacted to protect the Nation adequately against the risks to life and property that are inherent in the transportation of hazardous materials in commerce is discussed. Emphasis is placed on transportation of hazardous materials by air.

g. RESEARCH AND DEVELOPMENT PROGRAMS

1532. Sjolin V
FINANCING FIRE RESEARCH
Brandforsvar; 13(4): 21, 1976 (Swedish)

A proposal has been made in Sweden to build up a fund to finance fire research by levying a tax on fire insurance companies amounting to 1% of the annual total of insurance premiums and also to set up a single center for the collection of statistical data on fires and the study of their causes. (RZh)

1533. Anon
STRATEGY FOR INVESTIGATING PLASTICS AND FIRE
Fire; 69(859):409, 1976

The Fire Research Station (UK) has made an intensive effort to examine research needs regarding the fire performance of synthetic and polymeric materials from both the regulatory and experimental viewpoint. The British Plastics Federation has undertaken a comprehensive exercise to identify those constraints to the plastics industry's markets that are being experienced and are anticipated as a result of the performance of plastics products related to fire. Both these inputs have been analyzed by the Federation's fire committee. This report describes the objectives, scope, and outline for an investigation of plastics in fire.

1. GENERAL

g. Research and Development Programs—Continued

1534. Anon
SCIENTIFIC ACHIEVEMENTS IN THE FIRE-PROTECTION FIELD
Pozhar delo; (8):1-3, 1976 (Russian)

The most important innovations in the field of fire prevention in the USSR are as follows: the five-year plan of the USSR is providing for the introduction of technical fire-protection standards for every branch of the economy, the establishment of an information center for fire technology, the production of fire-resistant materials and building components, as well as the development of modern fire extinguishants and extinguishing methods. Details concerning the tasks facing Soviet scientists, designers, and institutes and the successes that have been achieved are reported in the article. 2 figs. (Fachdok 13/0211)

2. DYNAMICS AND MECHANICS OF FIRE

a. FIRE BUILDUP, PROPAGATION, AND SPREAD

1535. Lee SL and Otto FW
EFFECT OF EXTERNAL VORTEX ACTIVITIES ON THE INTERNAL FLOW FIELD IN HIGHRISE BUILDINGS
Arch Termodyn Spal; 7(4):601-610, 1976

In a most crucial part of the development of the flow field induced by two simulated burning buildings partially facing each other across a street, the flows, internal as well as external, to the buildings are found to be dominated by the presence of a powerful gross vortex in the street. In particular, the flow and temperature fields in a corridor with interior ventilation are strongly controlled by the vortex. On the other hand, measurements of these flow and temperature fields give a vivid description to the behavior of the vortex in the street. It is of great interest to note that this vortex under certain conditions oscillates back and forth between the two buildings in a regularly periodical fashion. 6 figs, 6 refs. (Author)

1536. Vogel BM
A STUDY OF FIRE SPREAD IN MULTI-FAMILY RESIDENCES: THE CAUSES — THE REMEDIES. Nat Bureau Standards, Center for Fire Res, Washington, DC; NBSIR 76-1194, 18 pages, 2 tables, 6 refs, Feb 1977
Availability: NTIS

This report identifies the major elements contributing to the spread of fire in multi-family buildings, where the fire is beyond the area of origin. The data have been collected from 84 separate fires involving lowrise (garden apartment) residential buildings in the Washington, DC, metropolitan area. This report categorizes the contributing factors of the fire spread into construction deficiencies, design deficiencies, and possible code violations, and suggests the need for specific revisions to building codes. (Author)

1537. Dryer RL, Glassman I and Sirignano WA
A PROBLEM IN FIRE SAFETY: FLAME SPREADING ACROSS LIQUID FUELS. Princeton Univ, Dept Aerospace and Mech Sci, Princeton, NJ; PUAMS 1308, NBS GCR-76-79, 30 pages, Sep 1976, NTIS PB-259 127/9GA

This report provides a brief summary of experimental and theoretical work carried out at Princeton University on flame spreading across liquid fuels. The importance of surface-tension-driven flows ahead of the flame front in controlling flame spread across liquids at temperatures below the flash point was demonstrated experimentally. Buoyancy and radiation effects were also present but were of lesser importance. Variations in the temperature of the liquid surface are attributed to eddies in the gas phase ahead of the flame front. These eddies may also play a role in flame propagation across solid combustibles. It is proposed to investigate these eddies by means of laser doppler velocimetry. A two-dimensional, steady-state computer program is under development for use as a tool in studying flame propagation above liquid and solid fuels. (Author)

1538. Seidel K-W
METHODS OF PREDICTING THE PROGRESS OF FIRES ON THE BASIS OF STATISTICAL DATA
Fire Protection Seminar, Internat, 5th, Papers, Vol 2; 1976, Sep 22-24, Karlsruhe, FRG, pages 265-284 (German)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

Predictions of the progress of fires using statistical data can be made, but are dependent on the manner in which the course of a fire has been broken down into phases and on the quantity of data available. Another prerequisite is the assistance of a computer. As a by-product, classification of the causes of fires and their statistical evaluation can also yield no less important take-off points for preventive fire protection. 2 figs. (Author)

b. FLAMMABILITY, IGNITION, AND EXTINCTION

1539. Anon
PROBLEMS IN COMBUSTION AND FIRE EXTINGUISHMENT [Problemy Goreniya i Tusheniya Pozharov]
VNII Protivopozhar Oborony, Moscow, USSR; 259 pages, 1975 (Russian)

This volume contains the papers presented at the Fourth All-Union Scientific and Technical Conference on Problems in Combustion and Fire Extinguishment sponsored by the All-Union Fire Protection Research Institute, the Central Fire Protection Administration of the Ministry of Internal Affairs of the USSR, the Scientific Council of the State Committee on Science and Technology of the Council of Ministers of the USSR, the All-Union Central Council of Professional Unions on Problems of Occupational Safety, and the Chemical Physics Institute of the Academy of Sciences of the USSR. Presented at the conference, which was held at the All-Union Fire Protection Research Institute in Moscow, were papers on combustion and fire extinguishment, inhibition of combustion, combustion of gases and aerosols, and organizational and practical fire-protection activities. (RZh)

2. DYNAMICS AND MECHANICS OF FIRE

b. Flammability, Ignition, and Extinction—Continued

1540. Stolp M
THE EXTINCTION OF SMALL WOOD CRIB FIRES BY WATER
Fire Protection Seminar, Internat, 5th, Papers, Vol 2; 1976, Sep 22-24, Karlsruhe, FRG, pages 127-141
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

An experimental approach has been chosen to resolve some problems in connection with the "reaction" of water and fire. Although it is recognized that the penetration of the water to the seat of the fire is also important, this problem was not investigated. Plain water was applied to the top of a burning wood crib and spread over the surface either by rotating the wood crib, the jet or both. The rate of burning of a wood crib is generally regarded as an essential parameter in describing the fire behavior. (Author)

c. FLOW OF COMBUSTION PRODUCTS

1541. John R
SMOKE-GAS AND AIR FLOWS THROUGH OPENINGS IN FIRE COMPARTMENTS
Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 39-61 (German)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

Volumetric flows of air and smoke gas between a fire room and its surroundings are caused by differences in pressure existing between the fire room and its surroundings. These pressure differences and the volumetric flows of air and smoke gas exchanged between the fire room and its surroundings through openings are determined as a function of the progress of the fire. On the basis of calculated pressure differences the desired design data for pressurized ventilation systems are obtained, with which smoke can be prevented from issuing from the fire room into adjacent rooms. 10 figs, 6 refs. (Author)

d. INSTRUMENTATION

e. METEOROLOGY

f. RADIATION

1542. Palmer TY
ABSORPTION BY SMOKE PARTICLES OF THERMAL RADIATION IN LARGE FIRES
J Fire Flammability; 7(4):460-469, 1976

Smoke particles absorb much of the thermal radiation from a large fire. This process affects the vertical velocity of the convection column, and it affects fire spread because of the effects of absorption on radiative heating of fuels ahead of the fire. The magnitude of these effects is difficult to analyze scientifically for a number of reasons. Data on parameters of a large fire, such as size of smoke particles and mass density per unit volume, are almost completely lacking. Furthermore, measurements of radiation absorption at several different wavelengths during a free-burning fire are lacking. And finally, the vagaries of the ambient atmosphere complicate the stochastic nature of the problem. This paper reports a technique of estimating absorption of thermal radiation by using data from an experimental fire. Measurements of solar radiation and fire radiation were combined with observations on smoke columns in a way that permits average absorption to be calculated. 6 figs, 9 refs. (Author)

1543. Markstein GH
SCALING OF RADIATIVE CHARACTERISTICS OF TURBULENT DIFFUSION FLAMES. Factory Mutual Res Corp, Basic Res Dept, Norwood, MA; FMRC 22361-4, NBS GCR-76-80, 51 pages, Jun 1976
Availability: NTIS PB-259 126/1GA

Despite its recognized important role in fire, radiative energy transfer is relatively less well understood than other aspects of fire spread. As yet, a quantitative determination of fire radiation from first principles is not possible, and alternative semi-empirical methods must be employed. The present study, as part of a continuing effort to provide quantitative formulations of fire radiation, deals with the particular case of scaling the radiative properties of turbulent gaseous-fuel diffusion flames with fuel flow rate. Although currently restricted to this type of flame, the success of the work suggests that the general principles developed here may be applied in future studies to other types of fires such as pool or wall fires. (Author)

g. THERMAL CONDUCTIVITY

3. BEHAVIOR AND PROPERTIES OF MATERIALS

[For literature on fire and flame retardants, fire and flame proofing, etc, see ***Chemical Abstracts***.]

a. CHARACTERISTICS AND THERMAL BEHAVIOR OF MATERIALS

1544. Meyer E
CHEMISTRY OF HAZARDOUS MATERIALS
Prentice-Hall, Inc, Englewood Cliffs, NJ; 370 pages, 1977

Which chemical products are toxic? Flammable? Explosive? Which react chemically with release of heat? The correct answers, answers that could mean the difference between safety and danger, even life and death, are found in this clearly detailed, up-to-date study of the hazardous materials used domestically and in industry today. The author highlights the chemical and physical properties of hazardous materials. More chemistry oriented than other books in the field, it can be used easily by both nonscientific and scientific readers; a chemistry review is included. Some of the subjects covered include: principles of chemical reactions; chemistry of common elements; chemistry of water reactive materials; toxic materials; plastics, resins, and fibers; radioactive materials; and many others, including first aid and emergency treatment in the event of poisoning or exposure.

1545. Zhukov VV
CAUSES OF EXPLOSIVE SPALLING OF CONCRETE IN A FIRE
Beton Zhelezobeton; (3):26-28, 1976 (Russian)

On the basis of experimental information and theoretical investigations an analysis is made of the causes of explosive spalling during a fire. A calculation method is formulated, and methods of countering this type of destruction are given.

1546. Anon
MATERIALS FIRST IGNITED
Fire Prev; (116):11-15, 1976

Six out of seven fires begin in textiles, wood, paper, plastics, and other common solid materials. In drawing up safety procedures in any type of occupancy it is therefore clearly helpful for the safety staff, the building managers, and those responsible for handling and storage of materials, to be aware of the ways in which such materials are commonly ignited, their fire behavior, how they may contribute to fire spread, and any particular fire dangers associated with them. The combustion behavior of these common solid materials is examined with a view to reducing the number of fires in which they are involved. 7 photos.

1547. Anon
MASONRY AND FIRE SAFETY
Internat Fire Chief; 43(1):4-9, 1977

The fire-resistive and noncombustible properties of masonry (brick, concrete block, facing tile, stone, marble, ceramic tile, plaster and terazzo) are described in terms of the dominance of masonry as a fire control system. The fire control consists in reducing the smoke hazard and acting as fire and smoke barriers. Availability, cost effectiveness, design flexibility, erection time, durability and low maintenance are also discussed. 3 figs, 2 tables.

1548. Hadvig S and Paulsen OR
ONE-DIMENSIONAL CHARRING RATES IN WOOD
J Fire Flammability; 7(4):433-449, 1976

A thermal model is given, supported by measurements made by the authors, as well as by Thomas, Butler and Schaffer. The model is specialized in a number of cases, making it easy to apply. A comparison between the measurements and the model indicates that, with the parameters used, a reasonable physical-chemical adaption is achieved, so that the model can be used for several different types of wood. 6 figs, 3 tables, 14 refs. (Author)

1549. Hilado CJ
FIRE-RESPONSE CHARACTERISTICS OF NON-METALLIC MATERIALS: A REVIEW OF RECENT PAPERS AND REPORTS
J Fire Flammability; 7(4):539-558, 1976

Non-metallic materials should be considered from the systems viewpoint, because materials acquire their importance from their contribution to a total system. Systems can be divided into subsystems; subsystems can be separated into components, and components into individual materials. A building or vehicle can be divided into rooms or compartments, which in turn are made up of walls and items of interior furnishings; all these can ultimately be separated into individual materials. Most of the work on fire response characteristics has been done on materials, much less on components, and even less on subsystems and systems. Fire experience represents a source of considerable information on systems, because an actual fire is the ultimate fire test. The number of deaths in a fire is the number of persons who need not have died, had the materials found proper use in the system. Relevant papers and reports published in 1974 through 1976 indicate that fire spread, heat, and smoke were the most critical fire response characteristics in fatal fires in buildings, and that fire spread, smoke, and toxicity were the most critical fire response characteristics in vehicle fires. Fire response tests involving complete systems, subsystems, and components have been concentrated on buildings and aircraft. This concentration appears to be responsive to the number of multiple-death fires, rather than to the total number of deaths within a given time period. Fire response tests performed for comparing materials have been concentrated on ignition, smoke, and toxicity. 10 tables, 100 refs. (Author)

1550. Origgi P
FLAMMABILITY OF PLASTIC MATERIALS
Mater Plast Elastomeri; (2):120-129, 1976 (Italian)

Various articles have been published on the topic of the flammability of plastic materials. Examined here is the degree of fire hazard in order to arrive at an experimental determination of the relative toxicity index of various materials. Discussed in general are the causes of fires and factors that contribute to the fire hazard. A detailed description is given of contact with flame, thermal shock, lack of oxygen, presence of CO and other gases that can develop during the combustion of various materials, such as CO_2, HCl, HCN, N oxides, SO_2, HF, $COCl_2$, aliphatic and aromatic hydrocarbons, toluene diisocyanate, and HBr. Other topics discussed are the presence of smoke, fear and panic, and the combined effect of these factors. Given in a table are the lethal levels for the various materials in rats and men at four-hour exposure time. 5 figs, 18 tables, 22 refs.

1551. Nelson GL, Bridgman AL, O'Connell WJJ and Williams JB
BURNING BEHAVIOR OF POLYCARBONATE IN CORNER AND WINDOW TESTS
Mod Plast; 54(3):76-79, 1977

The resistance to burning of PC wall panels in room-corner fire tests is considerably better than that of plywood, wood-chip/phenolic, and acrylics. PC also generates less heat rise and burns only minimally in simulated window fire tests. Radiant-panel test results (E-162) do not correlate with those of room-corner fire tests. 7 figs, 3 tables, 7 refs. (Author)

1552. Morris AW and Hopkinson JS
FIRE BEHAVIOUR OF FOAMED PLASTICS CEILINGS USED IN DWELLINGS. Fir Res Sta; BRE CP-73-76, 30 pages, 24 figs, 9 tables, 12 plates, Nov 1976

Experiments have been conducted on a range of ceiling materials incorporated in a full-scale model simulating a single-story dwelling or the uppermost floor of a flat or duplex block. The possibility of fire spread from one room into the roof space and subsequent re-entry into another room adjacent to the fire compartment has been investigated. Within the experiments there was fire spread into the roof space above in all cases, with earlier penetra-

3. BEHAVIOR AND PROPERTIES OF MATERIALS

a. Characteristics and Thermal Behavior of Materials—Continued

tion times with foamed plastics in comparison with traditional materials. The re-entry into the adjoining room was also dependent on the type of ceiling lining used. It is proposed to issue a further Current Paper in due course that will cover an investigation of the numbers of buildings in the United Kingdom in which these ceilings may be involved and the cost effectiveness of remedial measures. (Author)

1553. Rasbash DJ
THEORY IN THE EVALUATION OF FIRE PROPERTIES OF COMBUSTIBLE MATERIALS
Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 113-130
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

Certain properties of the volatiles produced during fire processes, *viz*, the heat of combustion, the heat required to produce the volatiles from the condensed phase, and the kinetics of the reaction between the volatiles and the atmosphere, have been considered in some detail and related to the ignition, extinction, rate of burning and heat production, and flame spread on burning materials. The kinetics have been expressed through a factor ϕ representing the fractional convective heat loss from the flame to the surface under ignition or extinction conditions. ϕ has been related to f, the fractional heat loss that a premixed flame may sustain without extinction, available evidence indicating that $\phi \sim 0.6f$. Methods for estimating values of ϕ for varying oxygen concentrations and ambient temperatures are suggested. 2 figs, 1 table, 23 refs. (Author)

1554. Klingelhoefer H-G
FIRE BEHAVIOR OF WALL AND CEILING COVERINGS IN ROOMS AND ON FACADES
Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 189-203 (German)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

Full-scale fire tests of various building materials for facade linings and wall and ceiling coverings in room interiors are reported in this paper. The extent to which the fire risk from these materials can be represented by the usual laboratory methods is discussed on the basis of the results. 8 figs, 8 refs. (Author)

1555. Kovacs K
BEHAVIOUR OF COMBUSTIBLE CLADDING MATERIALS IN FIRE AND THEIR MODEL TESTS
Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 205-222
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

In the years from 1971 to 1975 the Hungarian Ministry of Building and Urban Development, cooperating with the National Command of Fire Brigade Service, revised the fire-engineering regulations in building to adjust them to the up-to-date technical level. Both authorities agreed by common consent to not set fire protection requirements for the claddings of internal rooms of buildings. Restrictive measures have been taken, however, for the claddings of walls and floors in buildings for public use and culture, as well as escape routes (passages, staircases). The research work that started then is going on even now with the aim of developing and "domesticating" test methods, thus enabling the observation of standard specifications. This report gives a view of the initial results achieved in this stage of development. 10 photos, 1 table, 18 refs. (Author)

1556. Christian WJ, Castino GT and Beyreis JR
FIRE BEHAVIOR OF BUILDING INTERIOR FINISH MATERIALS
Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 223-246
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

Full-scale and laboratory experiments have been performed using 29 materials, including plastic, mineral, and wood products. In the full-scale experiments, the materials were applied as surface finish in corner and room geometries, and exposed to ignition sources of various intensities. Observations were made of fire propagation, temperature, and radiant heat flux. Laboratory-scale fire tests conducted on the same materials included the Steiner Tunnel (UL 723, ASTM E-84, NFPA 255, ANS A2.5), radiant panel (ASTM E-162), the NBS Heat Release Rate Calorimeter, and the Ohio State Heat Release Rate Apparatus. Results of the full-scale experiments and relationships with the laboratory fire tests are presented. 6 figs, 2 tables, 22 refs. (Author)

1557. Prager F
STUDIES OF THE FIRE BEHAVIOR OF UPHOLSTERED FURNITURE
Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 247-263 (German)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

The influence of various upholstered furniture components, such as padding, coverings and supports, on the ignitability, the contribution to flame spread and heat generation, and the secondary effects of fire are studied using the results of semi-real model fire tests. The possibility of producing relatively safe upholstered furniture combinations from such modern upholstery materials as foams based on polyurethane and coverings made of synthetic fibers is demonstrated in relation to comparable traditional combustible products. (Author)

1558. Lehnen AJ and Meckel L
TEXTILE FLOOR COVERINGS AND THE FIRE RISK
Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 267-276 (German)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

Since reliable statistics on the fire hazard associated with textile floor coverings are not available in the Federal Republic of Germany, it is necessary to rely on fire-service experience for an evaluation of the hazard. From these experiences, supplemented by fire tests of various floor coverings, it can be inferred that the fire risk is relatively low and that the qualities which, from a hazard standpoint, are critical can be determined by a not very expensive test method. 4 refs.

3. BEHAVIOR AND PROPERTIES OF MATERIALS

a. Characteristics and Thermal Behavior of Materials—Continued

1559. Zorgman H
BEHAVIOUR OF INSULATED STEEL ROOFS IN FULLY DEVELOPED FIRES
Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 277-292
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

The subject of this paper is the fire behavior of roofs consisting of trapezoidal steel sheeting insulated on the upper side by means of insulating slabs and finished with a roof-covering material, as more and more commonly used, especially in industrial buildings. 5 figs, 2 tables, 5 plates, 6 refs. (Author)

b. COMBUSTION, EXPLOSION, AND FLAMMABILITY TESTS AND METHODS

1560. Johnson RM, Smith CV and Leggett K
FLAMMABILITY OF DISPOSABLE SURGICAL DRAPES
Arch Ophthalmol; 94(8):1327-1329, 1976

The high degree of flammability of disposable surgical drapes is discussed. The results of two separate tests and corresponding photographs are presented to verify the flammability. The importance of the flame spread rate is stressed. 7 figs, 2 refs. (Author)

1561. Strehlow RA, Savage LD and Sorenson SC
COAL DUST COMBUSTION AND SUPPRESSION
Arch Termodyn Spal; 7(4):497-506, 1976

A novel coal dust burner has been designed and tested. It contains a central 2 x 3 in. stream in which up to 5 different gases and two different solid powders can be metered independently. This is surrounded by a 4 x 6 in. ignition stream that contains a stabilized methane air flame. Velocity profiles of both streams are quite flat at the burner head. The coal dust flame appears as a tent flame and its burning velocity is determined by measuring the average flame angle and using the formula $S = U \sin\Theta$, where U is the average approach flow velocity. Burning velocity has been measured for coal dust-air mixtures over the equivalence ratio range of 0.5 to 2.0. The burning velocity of Pittsburgh seam 10-90 μ size coal dust-air-suppressant flames at a loading of 200 mg/liter has been determined for the suppressants CO_2, N_2, He, Ar and Halon 1301 (CF_3Br). In addition, burning velocities were measured for coal dust in a controlled atmosphere of $He\text{-}Ar\text{-}O_2$ at O_2 concentrations of 12, 13 and 14% and different He to Ar ratios to determine the effect of thermal conductivity on burning velocity. The implications of our results are discussed. 9 figs, 6 refs. (Author)

1562. Ostrovskiy VV, Belinskiy EA, Semenov AK and Kirillov AP
RESULTS OF FLAME-SPREAD TESTING OF CABLES
Elektr Stn; (1):59-63, 1976 (Russian)

The aim of the tests was to determine the possibility and conditions of automatic spread of combustion by various kinds and brands of horizontal bundles of cables laid in the open air, both when ignited by an external fire source and after short circuits. Power and pilot cables with copper and aluminum conductors and oil-impregnated paper, rubber, polyethylene, and polyvinylchloride insulation in metal, rubber, and polyvinylchloride sheaths with and without protective coatings were examined. All cables laid in the open air spread flames spontaneously when certain conditions existed, such as those governed by structure, number and location of cables in the bundle, their initial temperature, exposure to ambient air and the air temperature. Short circuits in some cables do not lead to fire in cables that are heat-resistant under the given short-circuit conditions. If the cables have foreign combustible materials (paper, air, etc), fires may occur in the cables after shorting. Additional factors are considered, eg, different loading conditions (20-40 kA instead of 7 kA). 4 figs, 1 table.

1563. Bhat GR, Block I, Yeh K and Spivak SM
EXTINGUISHABILITY OF FLAMMABLE TEXTILES: PART 1. STATEMENT OF THE PROBLEM
J Consumer Prod Flammability; 3(3):155-165, 1976

Extinguishment is recognized along with exposure, ignition and combustion as the event which significantly controls the extent of burn injuries and related hazard in apparel fires. The behavioral, mechanistic and material aspects of the process are described in terms of three explicitly defined parameters: Extinguishment Strategy (ES), Extinction Mode (EM) and Extinguishability (E). In the framework of a unified approach to characterize extinguishment in apparel fires, ambient oxygen depletion, cooling by heat transfer from fabric to a neighboring body, transport of combustibles from the burning zone by blowing-off, and synergism of these three factors are recognized to be important. Accordingly, an extinguishability experiment that incorporates each of these segments is proposed, and its relationship to prior work is reviewed. 1 table, 15 refs. (Author)

1564. Miles L, Bhat GR, Sun RL, Yeh K and Spivak SM
EXTINGUISHABILITY OF FLAMMABLE TEXTILES: PART 2. EFFECTS OF AMBIENT OXYGEN CONCENTRATION
J Consumer Prod Flammability; 3(3):166-192, 1976

The factors influencing extinguishment of a fabric burning in a confined environment are examined. Certain theoretical considerations showed that the time to extinguish depends upon properly defined initial and final linear burning rates, oxygen sensitivity of linear burning rate and another quantity. The first three quantities are characteristics of individual fabrics and may be experimentally measured using a TRI Flammability Analyzer. The fourth quantity is shown to be a constant for a given fiber type and volume of the confined environment. Actual experiments were conducted in a TRI Flammability Analyzer to determine the influence of changes in ambient oxygen concentration on several flammability parameters. Such experiments also provided the necessary data for preliminary comparison with the theoretical treatment of extinguishability. It has been found that linear and mass burning rate and heat flux are each linearly dependent on ambient oxygen concentration for most fabrics within the range tested. Linear burning rate was found to be dependent upon both fiber type and construction, whereas mass burning rate and more profoundly heat flux were dependent upon fiber type rather than constructional effects. The analysis also suggests that under certain conditions,

3. BEHAVIOR AND PROPERTIES OF MATERIALS

b. Combustion, Explosion, and Flammability Tests and Methods—Continued

time to extinguish would decrease with increasing fabric weight for a given fiber type and environment. 9 figs, 4 tables, 5 refs. (Author)

1565. Yeh K
CALORIMETRIC STUDY ON THE BURNING OF DOUBLE-LAYER FABRICS
J Consumer Prod Flammability; 3(3):218-230, 1976

The burning behavior of cotton, polyester and flame-retardant treated cotton fabrics in double-layer structures was investigated with an isoperibol calorimeter. Specimens consisting of a two-layer combination of these fabrics in different configurations (top/bottom) were studied. The heat released during burning of each of the double-layer structures was measured and compared to that released from single layers of fabric. The effect of spacing between layers was also studied. The results indicated that the configuration has little effect on the burning of a cotton-cotton combination. However, cotton-polyester combinations are significantly affected by the configuration since the burning of the polyester in the cotton-polyester combination is strongly dependent on the amount of heat released from the cotton. Reduction of the data provides information regarding the combustion characteristics of the polyester fabric. 3 figs, 4 tables, 7 refs. (Author)

1566. Karim GA and Tsang P
A CONSIDERATION OF THE FLAMMABILITY OF MIXTURES RESULTING FROM MASS DIFFUSION
J Fire Flammability; 7(4):450-459, 1976

The flammability of mixtures formed by the combined effects of molecular diffusion and natural convection are considered in relation to methane and air within long vertical smooth circular tubes maintained at constant temperature. 6 figs, 4 refs. (Author)

1567. Lipowitz J
FLAMMABILITY OF POLY(DIMETHYLSILOXANES). 1. A MODEL FOR COMBUSTION
J Fire Flammability; 7(4):482-503, 1976

Little information is available concerning processes occurring in organosilicon flames. Octamethylcyclotetrasiloxane, $(Me_2SiO)_4$, as a major volatile pyrolysis product of the poly(dimethylsiloxanes) was examined in detail. Adiabatic flame temperatures and combustion products were calculated over a range of fuel/air ratios. Maximum temperature occurs near stoichiometric and is 200° higher than for paraffins, even though the heat of combustion (kcal/g) for the silicone is much lower. Calculated and observed combustion products from lean, pre-mixed flames are CO_2, H_2O and $SiO_2(\ell)$. Rich mixtures give inner (combustion to SiO_2 (ℓ), H_2, CO) and outer (further combustion of H_2 and CO) flame cones, supporting the calculations. Flame luminosity occurs for very rich mixtures at the onset of C formation. Pre-combustion zone sampling at 600°C in a diffusion flame shows CH_4, H_2, CO, CO_2, H_2O, C_2 and C_3 hydrocarbons to be major products. Pyrolysis GLC (gas-liquid chromatography) gives similar non-oxidative products, arising from C-H and Si-C cleavage, at similar temperatures. Major flame species detected by UV absorption are OH and SiO. Simultaneous increase and decay of these species during combustion, and low levels compared to organic flames suggests the following thermodynamically favorable reaction:

$$SiO + OH \rightarrow SiO_2\,(\ell) + H.$$

A model for poly(dimethylsiloxane) pool burning is given. 10 figs, 6 tables, 28 refs. (Author)

1568. Lipowitz J and Ziemelis MJ
FLAMMABILITY OF POLY(DIMETHYLSILOXANES). 2. FLAMMABILITY AND FIRE HAZARD PROPERTIES
J Fire Flammability; 7(4):504-529, 1976

Flammability and fire hazard properties of poly(dimethylsiloxane) fluids are compared to hydrocarbons of similar volatility characteristics. Small- and large-scale test data relating to ignition, fire growth and flame spread, heat release, extinguishment, smoke evolution, fire gases, toxicity of smoke and fire gases, and oxygen depletion are given. Volatile siloxanes (bp <250°C) tend to burn at higher rates than hydrocarbons of similar volatility. However fluids of bp >250°C undergo pool burning with concurrent surface oxidation, giving gradual formation of a white silica surface ash with a gelled methylsiloxane layer beneath. These reflective layers, if undisturbed, lead to marked reduction in burn rate with self-extinguishment for low-volatility, higher-MW fluids. High-MW fluids must undergo rearrangement to volatile cyclic siloxanes in order to burn, a process that is slow below 350°C. Large-scale pool burns, monitored by weight loss, heat flux and temperature measurement, clearly show the effect of ash and char formation in reducing burn rate. Smoke density testing indicates a lower hazard for silicones than for hydrocarbons. Extinguishment behavior is similar for hydrocarbons and silicones of comparable flash point. Silicone fluids of ⩾50 cs viscosity are less flammable than hydrocarbons of comparable viscosity, based on a number of small-scale test results. This is consistent with the lower volatility and higher thermal stability of the silicones. 12 figs, 10 tables, 15 refs (Author)

1569. Lindenmann WA and Hoffmann R
DETERMINING THE FAMMABILITY OF SOLID MATERIALS AT ELEVATED AMBIENT TEMPERATURE
Kunstst Plast; 23(2):8-9,11, 1976 (German)

Small-scale furnace tests of the flammability of wood, acrylic glass and soft PVC at ambient temperatures of 100-300°C show that the increase of flammability is of variable intensity for materials of the same flammability class. The method discussed in the article, in conjunction with a small-scale furnace test at 20°C, is suitable for the establishment of a more objective application of combustible materials for fire protection. This small-scale test makes it possible, in a simple manner, to compare a material with respect to fire behavior, even under flashover conditions, with known materials, eg, wood. It can contribute to minimizing large-scale tests. 4 figs, 2 tables, 4 refs.

1570. Brein D
MODEL FIRE TESTS TO DETERMINE THE COMBUSTION PROCESS IN FIRES OF SOLID MATERIALS. Univ Karlsruhe, FRG, Fire Prot Eng Res Center; AGF 30, 38 pages, 12 figs, 2 tables, 9 refs, Jul 1976
Availability: Fachdok

Within the framework of a research project continuing over several years model fire tests are being conducted on free-burning wood cribs of varying heights and duct dimensions made up of pine timbers of square cross section to determine the combustion process in fires of solid materials. Reported in the present article are measurements of the combustion rate, of the thermal radiation from the crib, and of the gas composition of the gas issuing from ducts in the crib. Measurements of the combustion rate led to an empirical equation that gives the trend of the combustion rate as a function of the geometric parameters for cribs square in plan ignited at one corner. Also reported are measurements of decrease in weight, volume and area of the individual timbers in the crib at a total loss of crib mass of 50%. Discussion of the measurement results shows that, especially in cribs with duct widths small compared to the timber thickness, the ducts become much wider through combustion, resulting in improved supply of combustion air and, hence, an increased combustion rate. The values obtained here serve as a basis for a computational model with which the ignition and combustion of wood cribs can be described. (Author)

1571. Vandevelde P
THE FUNDAMENTAL PARAMETERS DETERMINING THE FLAMMABILITY OF MATERIALS
Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 99-111 (French)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

In conventional tests, the evaluation of flammability depends essentially on the test conditions. To improve on this situation, evaluation should be based on the intrinsic characteristics of the material and the concept of "ignition probability" should be introduced. This study makes it possible to establish the part played by conventional tests in evaluating the flammability of materials. It explains the lack of correlation between results obtained by such methods. Introduction of the new concept of ignition probability makes it possible to solve the problem. There remains, however, an important problem, that of writing the three-dimensional distribution function of (T, 0, D). The examples given here demonstrate the importance of this function for evaluating the ignition hazard. 12 figs, 6 refs. (Author)

1572. Leuschke G
SPONTANEOUS IGNITION OF PARTICULATE MATERIALS
Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 145-159
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

The hazards of self-heating and spontaneous ignition of particulate materials are considered in this paper from the safety-engineering standpoint and relationships between spontaneous-ignition temperatures and the shape and size of accumulations of particulates are demonstrated using cork dust as an example. Warm storage tests are described and the results are presented graphically by various methods. Indications and recommendations regarding the application of such study methods and the usefulness of their results for practical needs are given. 7 figs, 1 table, 8 refs. (Author)

1573. Monakhov VT
EVALUATION OF THE CHARACTERISTIC SAFETY-ENGINEERING FACTORS OF FIRE-HAZARDOUS MATERIALS
Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 175-186 (German)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

A joint method is proposed for evaluating fire risk characteristics, the aim being to establish the safety characteristics used in practice to ensure fire safety with optimal safety factors. Implementation of the method to determine the reliability of published data on the lower ignition limit of a gas-air or gas-vapor mixture is shown using an example. 14 refs.

1574. Benjamin IA
REGULATION OF FLOOR COVERINGS
Fire Protection Seminar, Internat, 5th, Papers, Vol 3; 1976, Sep 22-24, Karlsruhe, FRG, pages 13-22
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

A review is presented of fire experience, prior experimental studies, and theoretical analysis of fire propagation in corridors due to the contribution of combustible floor coverings. The basis for the use of a radiant exposure in the development of the Flooring Radiant Panel Test is established. The details of the test procedure, its evaluation in an interlaboratory test program, and its validation in typical full-scale room and corridor configurations, are given. The proposed criteria for the regulation and controlled use of carpeting and other flooring materials in rooms, corridors, and exitways are summarized. 3 figs, 10 refs. (Author)

c. FIRE AND EXPLOSION HAZARDS OF MATERIALS

1575. Ishihama W, Enomoto H and Umeza M
EXPERIMENTAL STUDY OF EXPLOSION CHARACTERISTICS OF CARBONACEOUS DUST CLOUDS
Arch Termodyn Spal; 7(3):349-363, 1976

An experimental study was made to investigate the effect of content of volatile materials and particle size on the explosion characteristics of carbonaceous dusts such as coal, lignite, wood and agricultural dusts, using a new closed-type apparatus. Because agricultural dusts are cohesive and adhesive, 3% by weight of light magnesium oxide was added to improve the dispersibility. It was found that for cohesive and adhesive dusts the dispersibility should be improved to obtain reliable results. For this purpose adding the small amount of magnesium oxide was effective in that the optimum dust concentration at which the explosion pressure was maximum was 3 to 10 times higher than the stoichiometric dust concentration. 13 figs, 3 tables, 9 refs. (Author)

1576. Zhilo VN
IGNITION HAZARD OF EXPLOSIVES IN PNEUMATIC PIPES
Bezop tr prom-sti; (8):46-48, 1976 (Russian)

The author describes a charging device for pneumatic loading of shot holes with granulated explosives. Given are the results of a large number of tests that were performed to avoid electrostatic charging and the formation of sparks. Electrostatic charges can be avoided by maintaining a certain humidity and density of the explosive. Metallized explosives precipitate on the pipes. For this reason, the pipes must be purged (cleansed) from time to time. 1 fig, 4 tables. (Fachdok 13/0256)

1577. Anon

THE FIRE HAZARDS OF PLASTICS IN FURNITURE

Fire Prev; (117):26-32, 1977

A three-year research program carried out at the Rubber and Plastics Research Association (RAPRA) into the fire risks presented by the use of plastics in furniture and furnishings is reviewed. The research work involved a study of the ignitability and burning behavior of various foams and fabrics taken separately and in combination in standard laboratory tests and when subjected to *ad hoc* tests using common ignition sources, the ignitability and burning behavior of individual items of furniture and furnishings when subjected to the common ignition sources, and the rate of growth and spread of fire, the rate of temperature increase, and the generation of smoke and toxic gases when fully furnished rooms were set on fire, either with restricted or full ventilation. 8 photos, 2 tables, 3 refs.

1578. Kinoshita J

FIRES IN CHEMICAL PLANTS AS A RESULT OF GENERATION OF STATIC ELECTRICITY AND FIRE-FIGHTING MEASURES

Haikan gijutsu; 18(5):59-72, 1976 (Japanese)

It is reported that, under operating conditions, charges of static electricity are generated and accumulated during the following basic technological processes typical of chemical and, in part, petrochemical plants: drainage; filling and transferring clean oil products through pipelines and rubber hoses to storage tanks, in which case the degree of electrification of the flow of oil products in the pipelines depends on the dielectric properties and kinematic viscosity of the fluid, on the rate of flow, the diameter and length of the pipeline, the material, the roughness of the inner walls, the temperature of the fluid, and other factors; filtering oil products through porous materials; transporting compressed and liquefied gases through pipes and tapping them through openings; rubberizing fabrics; and manufacturing artificial and synthetic fibers, films, rubber, etc. The results of laboratory investigations of the dielectric properties of materials most susceptible to the accumulation of electrostatic charges are presented. Among these materials are, primarily, liquid hydrocarbons with a low electrical conductivity; benzene, gasoline, kerosine, ethylbenzine, isopropylbenzene, liquefied hydrocarbons, as well as chlorobenzene, ethyl ether, carbon disulfide, etc. 26 figs, 12 tables, 8 refs. (RZh)

1579. Novikova LV, Piskunov BF and Glikin MA

SPONTANEOUS IGNITION TEMPERATURES OF AROMATIC ACIDS

Khim prom; (1)26-28, 1976 (Russian)

Aromatic carbonic acids are initial products for the synthesis of organic dyes, medical preparations, synthetic fibers and some other valuable products. In order to ensure safe conditions for the production and processing of these acids, it is necessary to assess their degree of fire and explosion hazard. It is well known that thermophysical properties affect the fire and explosion hazard of compounds. The dependence of the flash temperature of liquid products on the boiling temperature and the influence of dispersivity on the combustion parameters of coals, sugar dust and metal dust have been widely studied. The dependence of the fire- and explosion-hazard properties on chemical structure has been less thoroughly studied, although it is known that the reactivity of materials is determined by their structure and by the presence of functional groups in the molecule. In studying anthraquinone derivatives it was shown that the self-ignition temperatures depend on the nature of the substituent in the nucleus. Consequently, on the basis of the structure of the carbonic acids and by analogy with the anthraquinone derivatives it can be expected that their explosion-hazard properties will be determined by the nature of the substituent in the benzene nucleus. 3 tables, 13 refs. (Author)

1580. Taubkin SI and Taubkin IS

CLASSIFICATION OF DUSTS BY FIRE- AND EXPLOSION-HAZARD PROPERTIES

Khim prom; (6):427-429, 1976 (Russian)

The deficiencies of the method of classifying dusts by fire- and explosion-hazard properties used in the Building Standards and Regulations (SNiP) and Regulations for the Construction of Electrical Systems (PUE) are discussed. The non-Soviet data relating to this problem are examined and recommendations are made to eliminate these deficiencies. 4 tables, 19 refs. (Author)

1581. Wakabayashi K

FIRE HAZARD OF SUBSTANCES AND MATERIALS

Soda to enso; 27(1):7-19, 1976 (Japanese)

Given are partial results of long-term laboratory research to determine and define the characteristics of a group of organic compounds and petroleum products widely used in industry, especially the characteristics reflecting the fire hazard of these substances. Among the substances under study are acetone, aniline, isooctane, vinyl chloride, paraffin, carbolic acid, gasoline, hexane and a number of others. Precise ignition temperatures of these substances under various ambient conditions are given in table form. Special attention is devoted to various combinations of these substances, in particular the new properties acquired upon interaction of the components at various volumetric concentrations. The ignition temperatures for various pairs are given graphically as a function of the ratio of components and parameters of the ambient medium: temperature, humidity, pressure, etc. Also studied during the experiments are the aerodynamic and hydrodynamic characteristics of the substances using special test stands, the design and operating principle of which are described. Obtained in particular were generalized viscosity laws of a number of liquid and gaseous substances and compounds for various conditions. The research results will be used to compile an industrial reference work on the fire safety of substances and compounds. 14 figs, 7 tables, 14 refs. (RZh)

3. BEHAVIOR AND PROPERTIES OF MATERIALS

c. Fire and Explosion Hazards of Materials—Continued

1582. Monakhov VT
FIRE SAFETY AND CLASSIFICATION OF THE FIRE-HAZARD INDEXES OF SUBSTANCES
Zh Vses Khim O-va; 21(4):366-369, 1976 (Russian)

An analysis is made of the quantitative conditions which, if met, will ensure the fire safety of premises. The fire-hazard indexes of substances are classified by the method of their use. The ignition limits, minimum explosion-hazard oxygen content and inhibiting concentrations, minimum fire-hazard pressure, the critical (inhibiting) dimension, combustibility group, oxygen index, flash temperature, minimum ignition temperature, smoldering temperature, spontaneous ignition and thermal self-ignition temperatures, minimum electrical current density, maximum charge in a pulse, linear ignition energy density, and maximum charge density on a dielectric surface are studied. A quantitative expression is given for evaluating the cost effectiveness of a fire prevention and protection system. The expression fully satisfies the requirements of standard GOST 12.1.004-76. 1 table, 29 refs. (Author)

1583. Libman BYa, Cherepanov SI, Sosunov AA and Padchenko SP
METHODS OF CALCULATING THE FIRE-HAZARD CHARACTERISTICS OF FUELS. AUTOIGNITION TEMPERATURE OF ALCOHOLS AS A FUNCTION OF THEIR BOILING TEMPERATURE
Zh Vses Khim O-va; 21(4):459-460, 1976 (Russian)

In this brief communication an effort is made to relate the autoignition temperature of alcohols with their boiling temperature. The boiling temperature is chosen as a parameter governing the autoignition temperature because the boiling point is a function of both the molecular weight and the mean length of the molecule. Literature data (presented in a table) were used to derive the formula. 1 fig, 2 tables, 9 refs. (Author)

d. NATURE OF COMBUSTION PRODUCTS

1584. Borsini G and Cardinali C
SMOKE EMISSION OF AIRCRAFT SEAT MATERIALS
J Fire Flammability; 7(4):530-538, 1976

Results of measurement of the density of smoke emission of nonmetallic materials that are present in a conventional aircraft passenger seat are reported in this article. A group of advanced materials (textiles and plastics) was selected. A comparison with traditional materials was made. It is therefore possible to select materials based on smoke-density level: as a consequence, seat design can be changed drastically, eliminating some materials and promoting others that better comply with low smoke emission. 6 tables, 13 refs. (Author)

1585. Woolley WD and Fardell PJ
FORMATION OF A HIGHLY TOXIC ORGANOPHOSPHORUS PRODUCT (TMPP) DURING THE DECOMPOSITION OF CERTAIN POLYURETHANE FOAMS UNDER LABORATORY CONDITIONS. Fire Res Sta, Borehamwood, UK; Fire Res Note 1060, 13 pages, 6 figs, 1 table, 1 ref, Nov 1976

Details are given of a method for the decomposition of small quantities of polyurethane foam and the collection and direct analysis of a highly toxic bicyclic phosphorus compound (termed TMPP) produced from the thermal decomposition of foams containing trimethylol propane polyols in combination with phosphorus-containing additives. A range of typical commercial flexible and rigid polyurethane foams and polyisocyanurates available in the United Kingdom up to and including the period of 1974 to 1975, when the problem was first identified by bioassay tests, have been tested for potential TMPP release. Flexible and rigid polyurethane foams yield zero to 0.004 and zero to 0.003 weight per cent conversion of foam to TMPP respectively at 500°C. The polyisocyanurate foams show two distinct ranges of zero to 0.003 and 0.1 to 0.15 weight per cent conversion. A detailed study has been carried out with the polyisocyanurate foams that fall in the high-yield range to monitor the temperature dependence of TMPP production in both nitrogen and air atmospheres. The optimum temperature of formation is 600°C in nitrogen and 500°C in air. The maximum temperature at which TMPP is released is about 800°C in nitrogen and 700°C in air, which is consistent with the thermal stability of TMPP obtained during direct experiments with TMPP alone. This work is of a laboratory nature and supplements other work being carried out internationally to evaluate the overall hazard associated with the release of TMPP from foams under fire situations. (Author)

1586. Hoyland O
INORGANIC, TOXIC COMPONENTS DEVELOPED DURING PYROLYSIS OF PLASTICS, COMPARED WITH THOSE FROM WOOD AND MINERAL WOOL
Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 133-143
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

In the last few years an increasing use of plastics in building materials has taken place. Combustion of polymers results in toxic, gaseous products, as also will combustion of other organic materials. These toxic components resulting from fire can be harmful to people such as firefighters. Statistics on fires reveal that more people die from inhalation of toxic gases than from high temperatures. In order to find out which inorganic toxic substances are evolved and to determine their concentrations, The Fire Research Laboratory, The Norwegian Institute of Technology, has analyzed the combustion gases developed from four commercial plastics by thermal decomposition. The toxic components in the gases evolved during the combustion of plastics are compared with those from combustion of wood, wool and mineral wool. An incomplete combustion of a carbonaceous compound will always produce carbon monoxide (CO). Some plastics contain nitrogen in their molecules, and the inorganic toxic compounds may be hydrogen cyanide and nitrogen oxides. Other plastics have chlorine in their molecules, and among the toxic components small amounts of phosgene, in addition to hydrochloric acid, can be determined in the combustion products. 12 figs, 4 refs. (Author)

e. PROTECTION AND MODIFICATION OF MATERIALS

1587. Rains WA
A NEW ERA IN FIRE PROTECTIVE COATINGS FOR STEEL
Civ Eng; 46(9):80-83, 1976

3. BEHAVIOR AND PROPERTIES OF MATERIALS

e. Protection and Modification of Materials—Continued

New fireproofing materials for steel, three out of ten resulting from technology transfer from the aerospace projects, are discussed, particularly the sprayed mineral fiber or sprayed cementitious fireproofing materials that have largely replaced concrete. The three major categories of the new generation of fireproofing materials, namely, medium-density inorganic systems, low-density inorganic systems, and organic systems, are described. 4 figs, 1 table.

1588. Nagdi K
EFFECT OF FIRE-RESISTANT PRESSURIZED FLUIDS ON ELASTOMERS
Maschinenmarkt; 82(33):573-575, 1976 (German)

The necessity of replacing the combustible fluids used as working fluids in hydraulic systems by non-flammable or fire-resistant fluids is demonstrated. But to do so requires preliminary tests to determine the behavior of sealants, especially rubber, on the test fluids. A classification of fire-resistant and incombustible fluids is given; a method of testing the behavior of rubber in fluids as a function of various factors is presented. The regulative documents governing the test method are discussed. 1 fig, 2 tables, 6 refs. (RZh)

1589. Alibaev K and Kasymbekov S
INTUMESCENT "EKRAN" COATINGS
Pozhar delo; (7):29, 1976 (Russian)

Several types of intumescent coatings based on urea formaldehyde resin and soluble silicate have been developed by the Fire Engineering Station of the Fire Protection Administration of the Kazakh SSR (USSR). Two types of coating are being produced, one for wood and one for metal structures. Both coatings are to be used in closed premises with a relative humidity not greater than 80%. The fire-protection mechanism of intumescent fire-resistant coatings and methods of applying the "Ekran" and "Ekran-M" coatings on structures are considered. The first coating makes wood fire-resistant, the second gives metal structures a fire endurance rating of not less than three-quarters of an hour. (RZh)

1590. Azatyan VV
EFFECT OF CHEMICALLY ACTIVE IMPURITIES ON CONDITIONS PRECEDING IGNITION AND EXPLOSION
Zh Vses Khim O-va; 21(4):426-433, 1976 (Russian)

The spontaneous ignition conditions of combustible gas mixtures in the presence of inhibitors, the effective duration of the inhibitor, and the role of the individual stages are examined quantitatively. The role of quadratic reactions of active centers in inhibited combustion is assessed. The results of calculations are compared with the experimental data. 6 figs, 39 refs. (Author)

1591. Denisov AS, Eremeev VV, Ryzhov GN and Slyusarev IP
HEAT-INSULATING COMPOSITION
USSR Patent No. 481,583; Cl C04B 34/00, C04B 13/04, Appl 2 Mar 1973, Discl. 18 Nov 1975, Assignee: Vses n-i i proekt in-t "Teploproekt"

A heat-insulating composition consisting of Portland cement, granulated rock wool, and a porous filler is described. The composition is different in that in order to ensure hardening of the composition in freezing temperatures and protection of fixtures against corrosion, it contains expanded perlite as the filler, the ratio of components, in weight %, being: 6-15 granulated rock wool; 55-69 Portland cement; 4-28 expanded perlite; 0.1-4.0 sodium nitrate; 1-8 potassium nitrate; 1-8 potassium nitrite; and 0.04-1 sulfite-alcohol residue. (RZh)

1592. Alvares NJ
IGNITION INHIBITORS FOR CELLULOSIC MATERIALS. Univ of California (Livermore), Lawrence Livermore Lab; CONF-760826-4, 7 pages, Apr 1976
Availability: NTIS UCRL-78026

By exposing samples to various irradiance levels from a calibrated thermal radiation source, the ignition responses of blackened alpha-cellulose and cotton cloth with and without fire-retardant additives were compared. Samples treated with retardant compounds which showed the most promise were then isothermally pyrolyzed in air for comparisons between the pyrolysis rates. Alpha-cellulose samples containing a mixture of boric acid, borax, and ammonium di-hydrogen phosphate could not be ignited by irradiances up to 4.0 cal $cm^{-2}s^{-1}$ (16.7 W/cm^2). Comparison of the specimens ignited, but flaming lasted only until the flammable gases were depleted. Cotton cloth containing a polymeric retardant with the designation THPC + MM was found to be ignition-resistant to all irradiances below 7.0 cal $cm^{-2}s^{-1}$ (29.3 W/cm^2). Comparison of the pyrolysis rates of the retardant-treated alpha-cellulose and the retardant-treated cotton showed that the retardant mechanism is qualitatively the same. Similar ignition-response measurements were also made with specimens exposed to ionizing radiation. It was observed that gamma radiation results in ignition retardance of cellulose, while irradiation by neutrons does not. (From American Chemical Society meeting, San Francisco, California, 29 Aug 1976.) (Author)

f. STABILITY OF MATERIALS AT ELEVATED TEMPERATURES

1593. Bub H
STRUCTURAL FIRE PRECAUTIONS IN PREFABRICATED CONCRETE CONSTRUCTION. PART 2
Betonwerk; 42(2):64-68, 1976 (German; English and French Summaries)

Research into fire risks has shown that the fire resistance of individual components, continuous beams and frames can now be estimated by calculation. Test stands are under construction in the Federal Republic of Germany (Brunswick, Dortmund), where large-scale tests can be performed to discover the assessment criteria for the calculation of overall structures or to consolidate existing knowledge. Most of the material used in this article comes from the Brunswick Technical University's Special Research Area 148, "Fire Behavior of Components" (director Prof. Dr.-Ing. Kordina) and the test results of the Dortmund Materials Testing Center. It will be seen that in the area dealt with here there is still scope for an expansion in knowledge, a wide field for research. Experience has shown, however, that dangers in the event of fire can be greatly reduced by sensible design and operational measures. Here concrete and reinforced

3. BEHAVIOR AND PROPERTIES OF MATERIALS

f. Stability of Materials at Elevated Temperatures—Continued

concrete have the advantage that the material itself is not combustible, and the components have a good resistance to fire even without additional measures. (Author)

1594. Anon
TIMBER AND WOOD-BASED MATERIALS IN FIRE
Fire Prot Rev; 40(435):31,33, 1977

Timber and its derivative board products are remarkably predictable in their behavior when exposed to fire conditions. The fire behavior of these materials, in particular their ignitability, fire resistance, and nature of the smoke they produce, as well as the pertinent British standards relating to ignitability, flame spread and fire propagation tests for materials, are presented.

1595. Adam M
ON THE FIRE BEHAVIOR OF CONCRETE BEAMS
International Association for Bridge and Structural Engineering Congress, 10th, Contributions of the French Group; 1976, Sep 6-11, Tokyo, Japan, pages 19-28
Sponsor: International Association for Bridge and Structural Engineering

Recalled in this paper is the traditional context of studying structures in fire and, particularly, verification of the satisfactory behavior of a structure. The study is based on one of several members subjected to heat in a furnace for various periods of time, followed by an indication of the present trend, which consists in developing the same verifications based on structural calculations. In order to justify these calculations, a major test program was carried out on 24 large beams, starting in 1973. An analysis of the measurements made during these tests revealed good agreement between the calculated and measured values, as well as the need to allow for the free water content of the concrete at each point in the section under study. 9 figs, 2 tables, 6 refs. (Author)

4. FIRE MODELING AND TEST BURNS

a. FIELD EVALUATION

1596. Anon
TANK FIRE EXTINCTION TESTS
Fire Prot Rev; 40(434):34, 1977

The Gothenburg, Sweden, Fire Department has conducted since 1973 a program of 46 tank fire extinction tests, the results of which are now available. Application techniques were base injection, foam chutes, and foam streams over the top of a 3.8-m diameter tank of volatile fuel. The foams used were fluoroprotein (FP70), AFFF, synthetic detergents and protein. The fire test results are summarized in a table giving application rate, 80-90% control time, and extinction times. 1 table.

1597. Tanaka T
A SOLUTION TO TRAIN FIRES
Jpn Railw Eng; 16(1):4-6, 1975

Fire tests of trains running on open tracks and through tunnels were conducted to determine the fire behavior. It was found that the measures now being taken to convert cars to a fire-resistant type with fireproof front and rear ends are remarkably effective. Fire is not greatly accelerated when trains continue running on open tracks. In tunnels, however, the fire spreads because of increased ventilation; the fire spreads in the direction opposite to the direction of motion. Fire spread is limited if doors and windows are shut. The undercarriage rigging is little affected by a fire. Overhead tunnel installations are also not greatly affected by flames pouring from windows of steel-framed and roof-sheathed cars. It is concluded that when a medium-sized fire breaks out in a train passing through a tunnel, the train can continue through the tunnel while the passengers in the fire car escape to adjacent cars. 2 figs, 1 photo, 2 tables.

1598. Malhotra HL
FULL-SCALE AD HOC FIRE TESTS: THEIR MEANING, LIMITATIONS AND ROLE
Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 63-69
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

Full-scale *ad hoc* tests are entering the fire scene in large numbers; there is a need to understand their nature, the type of information they can provide, their limitations and capabilities. The paper draws attention to the caution to be exercised in the interpretation of data and advocates six points when devising or utilizing such tests. 1 table, 12 refs. (Author)

1599. Bechtold R
REPORTS ON FIRE TESTS IN A FOUR-STORY RESIDENTIAL BUILDING. PART 1
Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 71-84 (German)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

A report is made on fire tests devoted to the study of the fire behavior of structural components and of the fire process outside the facade of the building under near-actual conditions. The fire exposure was realized by the progress of natural fires with furniture or wood-crib fire loads and by oil heating in accordance with the standard fire defined in German Industrial Standard DIN 4102. The principal fire-induced changes in the structural components (temperature increases, deformations, appearance of cracks) were recorded as a function of the duration and intensity of the fire. A report is made on some new and important insights gained in the course of the fire tests in another paper in this volume. 11 figs. (Author)

1600. Ehlert K-P
REPORT ON FIRE TESTS IN A FOUR-STORY RESIDENTIAL BUILDING. PART 2
Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 85-96 (German)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

Ten tests with real fires were carried out in a four-story residential building with a total of 16 apartments that had been scheduled for demolition. The test building conformed to all the presently valid structural conditions. Two tests were conducted with normal furnishings and eight with wood cribs, the fuel loads being 15, 30, 60 and 90 kg/m². The test arrangement permitted measurement of the following parameters: a) fire development and fire spread in an apartment; b) fire spread from floor to floor; c) determination of gas concentration in fire rooms; d) determination of pressure conditions in fire rooms; and e) determination of heat flux densities in fire rooms. The results of the gas analysis, pressure measurement and heat-flux-density measurements are plotted with a reference temperature. 14 figs, 1 table. (Author)

b. FIRE TESTING, STRUCTURES

1601. Jach W
DEVELOPING AND TESTING A MOBILE AND A FIXED MEASURING SYSTEM FOR THE EVALUATION OF LARGE-SCALE FIRE TESTS
VFDB Z; 25(4):130-135, 1976 (German)

The design and structure of a measurement system to be used in a proposed fire-test house are discussed in detail. To measure the composition of fire gases, physical, physicochemical and chemical methods are used. The instruments for measuring the thermal conductivity, the paramagnetic properties (oxygen) of the infrared gas analyzers, ie, the gas trace analyzers, are described. In addition there are devices to measure the humidity, temperature, smoke density and pressure. The problems encountered in selecting and arranging the instruments to get realistic analytical results have been solved satisfactorily, as described in the paper. (This paper was presented at the public sessions of the Technical and Scientific Committee of the 1976 annual professional meeting of the VFDB in Berlin.) 8 figs, 5 refs. (Fachdok 13/0175)

1602. Holmes CA
ROOM CORNER-WALL FIRE TESTS OF SOME STRUCTURAL SANDWICH PANELS AND COMPONENTS. Forest Products Lab, Madison, WI; PB-258 513/1GA, 80 pages, May 1976
Availability: NTIS

This research was conducted as part of a larger program to establish fire performance criteria for structural sandwich assemblies used in housing. The program was carried out in cooperation with the Department of Housing and Urban Development. Fire performance of sandwich materials and panels in a room setting was compared, by a room cornerwall fire test, to the material performance in the 8- and 25-foot furnaces. The information obtained in the room corner-wall fire test was shown to be useful and necessary to supplement other laboratory results to more fully appraise the fire hazards of the material or assembly. (Author)

1603. Keough JJ, Rogleff S and Ganin D
PVC PIPES PENETRATING FIRE-RESISTING CONCRETE FLOORS. Dept of Housing and Construction (Australia), Experim Bldg Sta; TR 44/153/429(L), 35 pages, 12 figs, 16 tables, Jan 1976

A study was made of the extent to which the passage of soil and waste pipes through concrete floor slabs reduces the potential fire resistance of the floor slab. To simulate typical cases in construction an inverted concrete box with a variety of pipes passed through holes in the top of the box, supported above the box by a light steel framework, was made up as a 2-hour fire-rated enclosure. The box and pipe assembly was positioned above a gas-fired pilot furnace and the furnace was controlled to follow as closely as possible the time-temperature conditions defined in the Australian Standard on the fire-resistance test of structures. Four examinations were made of the performance of variants of the box-pipe assembly. The exercise indicates that unprotected metal pipes can represent a fire hazard in the story above after 30 min of the standard fire-test condition and that special fittings can be developed that will allow PVC pipes to equal this performance. Remaining will be the dual problem of the acrid fumes released by the burning of the PVC pipe in the fire-involved story and the eventual burning-through of the piping in the story above. (Author)

1604. Lindenmann WA and Hoffmann R
EXPERIENCE WITH THE REGULATIONS FOR TESTING THE COMBUSTIBILITY AND SMOKE GENERATION OF BUILDING MATERIALS IN SWITZERLAND
Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 161-174 (German)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

The regulation presently valid in Switzerland for the use of combustible building materials as well as the test methods being used are presented. Experience gained to date using this regulation is discussed on the basis of three examples: fires in a highrise laboratory building, in a tunnel, and in a warehouse for foams. 2 figs, 3 tables, 6 refs. (Author)

1605. Bellet H
REPRODUCIBILITY OF SOME FURNACES
Fire Protection Seminar, Internat, 5th, Papers, Vol 3; 1976, Sep 22-24, Karlsruhe, FRG, pages 5-12 (French)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

Two furnace reproducibility criteria have been chosen, either the loss in weight with time or the flux. But some reflection shows that these two factors are probably correlated, because the energy released per unit time is necessarily a function of the quantity burned in the same time interval and is therefore, in one way or another, a function of the loss in weight. It is hoped that other studies will be made of this subject, the knowledge of which affects test realism, which is what must be aimed at in the field of prevention. 6 figs, 1 table. (Author)

c. MODELING AND SCALING

1606. Chaiken RF and Singer JM
EXPERIMENTAL COAL MINE FIRE RESEARCH
Arch Termodyn Spal; 7(4):529-543, 1976

Model ducts lined with coal are being employed to study the nature of coal-mine fires: their rate of propagation, their influence on ventilation air flows, and their response to sealing and other fire-suppression measures. For scale modeling purposes it is planned to carry out these studies in various size ducts leading to a full-size mine-entry configuration in the Bruceton multiple-entry experimental mine. At present, however, work is being carried out in a 9.1 meter long duct lined with 5 cm thicknesses of coal and insulating brick leaving a 23x23 cm square opening for air ventilation. A number of probes are employed to follow the course of the fire, which is ignited at the upstream end of the coalbed. Experimental data are presented related to various fire characteristics that are believed to be important in actual mine fires. 9 figs, 3 tables. (Author)

1607. Anon

STANDARD FIRE TESTS IN RELATION TO ACTUAL FIRES

Fire Prot Rev; 40(435):16-17, 1977

Although it is essential to evaluate the reaction to fire of building materials and structural components by testing them, it has become increasingly evident that the test conditions do not accurately simulate all actual fire conditions. Materials and components may not behave as anticipated because of the difference in the fire and test conditions. The provisions of British Standard BS 476 dealing with Building Regulations fire tests are reviewed with an eye toward apparent failure to correspond with actual fire conditions.

The article is a review of a 1975 report of a Joint Committee of the Institution of Structural Engineers and the Concrete Society concerned with the "Fire Resistance of Concrete Structures."

1608. Nadeau HG and Waszeciak PH

DEVELOPMENT OF A SMALL CORNER TEST METHOD FOR THE PRELIMINARY EVALUATION OF FIRE PERFORMANCE OF RIGID CELLULAR PLASTICS WITH AND WITHOUT A PROTECTIVE COVERING

J Cell Plast; 12(4):208-219, 1976

A viewpoint of the "cellular plastics fire" problem is presented along with a two-fold approach to the solution of the problem. This approach presents the concepts of the use of thermal barriers to protect exposed foamed plastic insulation and the use of corner testing as a method of evaluating protection. A practical method of testing is advanced utilizing a small-sized corner (12:1) modified to match, in thermal characteristics, a larger-size structure. Information is presented to illustrate the use of this approach, its successful applications, and the limitations of the method. 4 figs, 6 tables, 14 refs. (Author)

1609. Fish RH

AMES T-3 FIRE TEST FACILITY — AIRCRAFT CRASH FIRE SIMULATION

J Fire Flammability; 7(4):470-481, 1976

There is a need to characterize the thermal response of materials exposed to aircraft fuel fires. Large-scale open fire tests are costly and pollute the local environment. This paper describes the construction and operation of a subscale fire test that simulates the heat-flux levels and thermochemistry of typical open pool fires. It has been termed the Ames T-3 Test and has been used extensively by NASA since 1969 to observe the behavior of materials exposed to JP-4 fuel fires. 11 figs, 7 refs. (Author)

1610. Meisters M

MORE REALISTIC TESTING OF SMOKE GENERATION

Plast Eng; 32(8):49-51, 1976

One of the procedures being reevaluated to create more realistic experimental smoke-generation testing is smoke density chamber testing. The aim was to develop a procedure for thermoplastics that melt and can drip when exposed to heat. The new method incorporates a horizontally oriented sample holder and two smoke density chambers that are inclined at an angle of 60° to the horizontal, a configuration designed to minimize the smoke impingement with a single chamber placed parallel to the sample surface. Also used was mass optical density as an alternative to specific optical density to relate smoke generation to mass rather than area. The smoke density chamber test can thus be used to evaluate the performance of materials and additives early in their development. The test data are presented in table form. 1 fig, 5 tables.

1611. Thomas PH

MODELLING AND FIRE TESTS

Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 13-22

Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

In 1960 the author prepared a paper for a VFDB conference on the subject of models in fire research in which the correlation and prediction of the size of flames in fires using the well-known scaling law based on a modified Froude number were discussed. At about that time much work was being done in Borehamwood using the same type of scaling on the design of roof venting systems, the results of which are currently being introduced into roof venting codes in Germany. This type of scaling is sometimes referred to as Froude-number scaling or atmospheric scaling of weak buoyant systems. During the last 15 years there has been considerable expansion in the interest and application of such scaling procedures and their extension in the United States and Germany. Rudolphi has been extending the work of Yokoi on flames from windows and Seeger and Wertenbach have been studying flames from tanks of liquid fuels. Although small-scale experiments have increased our understanding of fires, some people concerned with testing are increasingly skeptical about standard small-scale tests and would like to see more large-scale tests carried out. This contradiction is used as the theme of the paper and whether it is real or apparent is discussed. 2 figs, 24 refs. (Author)

1612. Croce PA

MODELING OF VENTED ENCLOSURE FIRES

Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 23-37

Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

A modeling hypothesis for quasi-steady enclosure fires has been tested with encouraging results. Experiments were performed in full-, half-, and quarter-scale enclosures using wood cribs as the fuel. Agreement of data among the different size enclosures was obtained for burning rate, gas and surface temperatures, gas species concentrations and measured external radiation flux. 11 figs, 1 table, 12 refs. (Author)

4. FIRE MODELING AND TEST BURNS

c. Modeling and Scaling—Continued

1613. Becker W, Boenold HJ and Egresi M

TESTING THE FIRE BEHAVIOR OF TANKS AND CONTAINERS FOR THE STORAGE, SUPPLY AND TRANSPORTATION OF COMBUSTIBLE LIQUIDS

Fire Protection Seminar, Internat, 5th, Papers, Vol 1; 1976, Sep 22-24, Karlsruhe, FRG, pages 293-309 (German)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

Model fire tests of containers with combustible liquids form the basis for fire-engineering requirements and test methods that are contained in technical specifications and regulations and which must be satisfied for the approval of tanks and containers made of plastics. Large-scale fire tests in England confirmed the results obtained in the model fire tests. They also led to new insights that now permit making a comprehensive evaluation of the fire-safety risks in the transportation and storage of combustible and hazardous liquids in steel, aluminum and plastic tanks. Plastic fuel containers are now being mounted on vehicles on the production line. A report is made on the development of a test method for the evaluation of the suitability of plastic fuel containers exposed to flame. Reserve fuel canisters are mentioned in this connection only for the sake of completeness. 21 figs, 8 refs. (Author)

1614. Fuchs P

FIRE AND EXTINGUISHING TESTS WITH VARIOUS EXTINGUISHANTS IN A FULL-SCALE TEST ENCLOSURE

Fire Protection Seminar, Internat, 5th, Papers, Vol 2; 1976, Sep 22-24, Karlsruhe, FRG, pages 143-154 (German)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

A report is made in the paper on full-scale fire and extinguishment tests in order to find suitable extinguishants and extinguishing methods that could reduce the water damage that usually occurs in present-day firefighting. A test facility was devised with which the data essential for the fire process, such as temperature history and combustion rate, could be determined. Tests carried out on wood cribs as the fire fuel are compared with other tests in which room fires with furniture were simulated. It turned out that the time of flashover, that is, the beginning of the fully developed fire phase, occurs earlier in furniture fires than in wood-crib fires. In the initial phase the fire developed more vigorously in furniture fires than in wood-crib fires, attributable to the more readily flammable textile components in the furniture. The mean maximum burning rate for the wood-crib fires (10.3 kg/min) is somewhat lower than in the furniture fires, in which 12.3 kg/min was found. The temperature trend was in all tests essentially the same, except in the initial phase. The fire was extinguished in cooperation with the Karlsruhe professional fire department, various extinguishants and methods being used. The attack was initiated at the time when about 42% of the fire fuel had burned. The quantity of water required to extinguish the fire and the amount of damage-causing water were measured. The evaluation showed that the amount of damage-causing water tends to be lower at lower application rates. Since fire tests with furniture are very expensive, a model fire load was devised, made up of various materials. With this model fire load it was possible to get a better reproduction of the fire process occurring in furniture fires than with wooden cribs. The study is not yet complete; the tests are being continued using a broad range of extinguishants. 6 figs, 1 table, 5 refs. (Author)

d. SYSTEMS BEHAVIOR

5. FIRE PROTECTION PRINCIPLES

a. BUILDING DESIGN AND CONSTRUCTION PRINCIPLES

1615. Anon

BASIC DESIGN REQUIREMENTS FOR FLOORS AND CEILINGS

Fire Prot Rev; 40(435):19,21, 1977

As one of the elements of a structure forming a compartment, a floor must resist fire, and therefore must prevent fire spread, for a period of time specified by whatever regulations apply to the premises concerned. Usually, a floor is a relatively complex element made up of the load-bearing members, the upper surface, and the ceiling. Floor construction varies from the timber floor with joists, upper surface boarding, and a plaster or cardboard ceiling, to the reinforced concrete floor in which the structure, upper surface, and ceiling form a single element. The fire-endurance capabilities of various floor and ceiling designs are examined with recommendations for increasing their fire resistance.

b. DETECTION AND ALARM EQUIPMENT

1616. Golik AS

GAS ANALYSIS METHOD OF DETECTING THE INCIPIENT STAGE OF AN ENDOGENOUS FIRE

Bezop tr prom-sti; (7):47-49, 1976 (Russian)

Coal mining organizations have been attempting to detect endogenous fires in coal seams by gas analysis (CO and CO_2). Numerous studies on models have been made in the laboratory of the Soviet Mining Research Institute to establish a correlation between the temperature at the point of fire origin and the gas composition. On the basis of 920 very exact gas analyses it has been found that mine fires can be detected about 10-18 days before ignition from the CO and C_2H_6 content in the mine damp. Governing factors and indexes are given that permit precise detection of endogenous fires. 3 figs. (Fachdok 13/0279)

1617. Avlund M

TYPE-TESTING OF AUTOMATIC FIRE ALARM SYSTEMS

Brandvaern; 2(5):22-24, 26-27, 1976 (Danish; English Summary)

The proliferation of automatic fire-alarm systems has been accompanied by an increase in the number of false alarms. The causes are effects from the ambient medium, such as heat, cold, moisture, vibration, etc, as well as incorrect choice and maintenance of systems. The structural principles of such systems and the types of tests given them and their components during manufacture and installation are considered. 2 figs, 2 tables.

5. FIRE PROTECTION PRINCIPLES

b. Detection and Alarm Equipment—Continued

1618. Anon
U/V FIRE DETECTOR SYSTEMS PROTECT OFFSHORE RIGS
Diesel Gas Turbine Progr; 42(1):47, 1976

The design and operation of the Edison Electronics ultraviolet fire detection systems for guarding compressors in oil rigs in offshore fields are described. 3 figs.

1619. Zakharov ND
EXPERIENCE IN DETECTING AND EXTINGUISHING FIRES IN CABLE ENCLOSURES
Elektr Stn; (1):57-59, 1976 (Russian)

In order to detect fires in cable enclosures automatically it is necessary to install a fire alarm system that is actuated by the appearance of smoke. A heat-responsive fire alarm does not ensure timely detection of a fire in cable enclosures. Water-spray fire-extinguishing systems for cable enclosures are quick and reliable. When water sprays are used to extinguish fires in cable enclosures, short-supply, rapidly deteriorating foam compounds are not needed, nor are water of drinking quality, complex equipment for proportioning foam compounds, frequent checks of the quality of the compound, or adjustments when changing compounds, all of which are necessary when foam extinguishing systems are used. 1 fig. (Author)

1620. Schaffernek AF
MODULAR CENTRAL EXCHANGE TECHNIQUES IN FIRE ALARM SYSTEMS
Elektro Anz; 29(6):123-127, 1976 (German)

Automatic fire alarm systems, which are limited exclusively to fire detection and warning, no longer fully meet the requirements imposed on all-around protection of human life and property. In addition, control problems, in the past very complex, must be solved and alarm systems must be developed for special kinds of operations. Optimal adaptation to the various problems makes it possible to advance a new concept of an automatic fire alarm system. A reasonable compromise is reached by combining two modular systems, fully compatible electrically and mechanically with each other, one of which contains components with specific alarm functions, the other with logical signal processing functions. 8 figs, 6 refs. (Author)

1621. Bolding JD
FIRE DETECTION IN UNATTENDED MACHINERY SPACES
Inst Marine Engs, Trans; 87:185-201, 1975

When a vessel is to be operated with an unattended machinery space, a fire detection system must be installed to replace the fire patrol function previously carried out by the watchstanding personnel. The paper describes the mode of operation of the various types of detectors currently available for protecting machinery spaces and the methods of testing their performance. Facilities required in control panels are mentioned, including fault monitoring of the panels and detectors. The design approach for the complete installation is explained together with the location and selection of detectors for particular areas. Commissioning of the system at the fitting-out stage and during sea trials is discussed. The paper was read at the Royal Institute of Naval Architects on Tuesday, 5 November 1974. The discussion is appended. 11 figs. (Author)

1622. Ovcharenko IR and Malyarchuk AM
RADAR DETECTION OF SELF-IGNITION CENTERS IN COAL PILLARS
Izv Vyssh Uchebn Zaved, Gorn Zh; (11):8-10, 1975 (Russian)

Radar detection of autoignition centers is based on the capability of radio waves to penetrate a coal seam to a certain depth and to reflect from some irregularity in the coal pillar. The irregularity can be considered as a point of autoignition, where the electrical properties of the coal, the electrical conductivity, change as a result of a sharp increase in temperature. It is expedient to use a CW radar with frequency as phase modulation for this purpose. With continuous-wave radiation the direct and reflected signals appear at the receiver output simultaneously, and since they differ in frequency, measurement of distance to the ignition center reduces to measurement of the beat frequency between the direct and reflected signals. It was found that it is possible and expedient to use a radar for this purpose if the wave reflected from the autoignition center is less than or equal to the diameter of the center. 1 fig, 5 refs.

1623. Anon
MINUTES TO LIVE: TIME TO ESCAPE THE FIRE
J Am Ins; 52(4):3-5, 1976

A household fire escape program, predicated on the installation of approved fire detectors in the home, is discussed.

1624. Joubert FE, Buchan LF and Beukes JDR
REPORT ON CARBON MONOXIDE MONITORING SYSTEM FOR THE EARLY DETECTION OF INCIPIENT FIRES IN MINES
J Mine Vent Soc S Africa; 29(4):74-80, 1976

The experience gained with a UNOR (Maihak, FRG) infrared carbon monoxide gas analyzer and a plastic tube gas collection system to detect CO in the parts per million range for the early detection of incipient fires in the underground workings of a coal mine is presented. 1 fig. (Author)

1625. Dalzell RW, Miller EJ and Thomas WE
EARLY FIRE WARNING SYSTEMS
Min Congr J; 62(3):22-27, 1976

The Ventilation Group of the Pittsburgh Technical Support Center, Mining Enforcement and Safety Administration (MESA), is reviewing the suitability of various detection techniques for use in an early warning system capable of monitoring mine air, determining whether such air contains contaminants from a developing fire or heating, and providing alarm before the fire or heating has progressed beyond the initial stages and before contaminant concentrations in the downstream air reach levels injurious to workmen. Carbon monoxide as a "state-of-the-art" indicator appears to be a viable and practical approach to early warning fire detection in coal mines. To obtain data in this detection area, MESA has made underground and laboratory tests of electromechanical detectors (ECD) and metal-oxide sensors (MOS). The preliminary test results indicate that the ECD is suitable, while the MESA-assembled MOS would require certain modifications before being considered for use as an early warning fire detector. 10 figs, 2 tables, 3 refs.

5. FIRE PROTECTION PRINCIPLES

b. Detection and Alarm Equipment—Continued

1626. Sayers B
AN APPROACH TO THE DESIGN OF FIRE DETECTION SYSTEMS FOR QUANTITATIVE RELIABILITY
Min Technol; 58(665):96-102, 1976

The function of a fire detection system is to detect the presence of a fire in the protected area at as early a stage as possible and to initiate further action. An alarm may be sounded to alert fire-fighting personnel or an automatic fire-fighting process may be started or both an alarm and an automatic sequence may be required. Three parameters are of importance to the fire engineer – capability, response and reliability. This paper is only concerned with the problem of reliability, and, in particular, the method of quantifying reliability so that the designer can specify in meaningful terms what the reliability of his system is. It is assumed throughout this paper that any fire protection system discussed is capable of detecting any fire with which it is designed to deal and will have an adequately fast response. In this paper the meaning of the term quantitative reliability is discussed initially in terms of probabilities. A method of assessing a simple fire-detection system is then explained and a means of determining the failure rate of equipment is indicated. Failure-rate prediction is of considerable value when accurate field data on equipment failures is not available. Finally, the usefulness of determining reliability in quantitative terms is demonstrated by reference to the use of redundancy techniques and self-monitoring circuits in order to improve the reliability of the simple fire detection system previously assessed. 5 figs, 2 tables, 10 refs. (Author)

1627. Fabie M and Leloup R
FIRE DETECTION
Prot Civ Secur Ind; (251):21-26, 47-51, 1976 (French)

The present technical status of fire detection is described. The characteristics and operating principles of various types of fire detectors, and circuit, electrical supplies, and control center requirements are cited. Methods of assessing the features of premises to be protected are given.

1628. Kazmierczak R
TRENDS IN AUTOMATIC FIRE DETECTION
Prz poz; 64(6):20-21, 1976 (Polish)

Information is presented on the operating principle and structural design of automatic fire alarm systems. A trend has been noted in many countries to tie such systems directly into the control centers of the local fire departments. Also considered are problems relating to the reliability of fire detectors. In particular, it has been found from tests conducted in the FRG that a heat sensor containing 2-10 components has a reliability factor of 0.904, whereas that of each component individually is 0.99. In order to reduce the number of false alarms received in the control center, a special computer is used in which the voltage and current strength of the signal transmitted by the system are recorded in digital codes. 3 figs. (RZh)

1629. Poulain P
APPROVAL TESTS OF AUTOMATIC DETECTORS AND CONTROL PANELS IN FRANCE
Rev Tech Feu; 17(154):22-25, 1976 (French)

The article is devoted to the problem of ensuring high-quality fire alarm systems, mass-produced, and conforming to the specifications of codes and standards. Devices are certified for compliance with codes in accordance with the results of tests of commercial models in the appropriate testing laboratories, which must be carried out in conformity with the specifications of the main organization for standardization in France, AFNOR. AFNOR develops and issues standards relating to the design of the equipment, the materials used, and the component parts, etc, as well as governing the test procedure: the nomenclature of the tests, the test conditions, the results obtained and their formulation, the setup and instruments used in the tests. Fire detectors must be tested for stability to thermal effects, vibration, shock, high humidity, stability to aggressive agents and to corrosion. References to the corresponding methods, codes and standards are given in the article, and the particular features of tests of different types of devices are mentioned. When testing the functioning of a device, care must be taken to see that the device responds correctly to the corresponding physical effects. For detection and alarm panels air-conditioning tests are of lesser importance than for fire detectors that may be located at the fire site. In tests of the functioning of control panels, the possibility of switching over to emergency power, of ensuring the supply of power to the detector network, of transmitting and processing signals from detectors, of localizing an actuated detector, of actuating an alarm or detector must be checked. It is emphasized that highly stable operation is of prime significance for both detectors and control panels. (RZh)

1630. Haessler M
CHOICE OF AN EARLY DETECTION SYSTEM
Rev Tech Feu; 17(154):26-27, 1976 (French)

The factors of influence in various stages of fire development, namely, the appearance of heat, light from flames, the emission of carbon monoxide, etc, which determine the choice of fire detectors and their sensitivity, are described. A method of experimental determination of detector sensitivity is given. 1 fig.

1631. Packham DR, Gibson L and Linton M
SMOKE DETECTION IN AIR-CONDITIONED AND VENTILATED BUILDINGS
Rev Tech Feu; 17(154):27-30, 1976(French)

It is pointed out that despite the great importance of fire alarm devices, their use turns out to be limited in a number of cases because of the particular features of fire development in certain situations. For instance, a smoke detector becomes useless if not much smoke is evolved by the fire. In addition, the effectiveness of such detectors in premises equipped with air-conditioning or ventilation systems can be reduced because smoke does not reach the ceiling-mounted detectors or because the detectors are screened off by various structural components of the building or even because the detectors are falsely triggered, eg, by cigarette smoke. It is emphasized that when developing detectors for fire alarm systems, special attention must be paid to ensuring detection of a fire in its various stages, especially when combustible materials are involved. Modern ventilation systems change the air 4 to 14 times an hour. In principle, therefore, fires can be detected by detecting smoke in the ventilation system; to date, however, no adequately reliable device has been created for this purpose. The principal aspects of the theory of smoke detection under such conditions are reviewed. It is assumed that the burning rate and the rate of smoke generation are constant and that the distribution of smoke in the premises is uniform. Experimental data on combustion and smoke generation obtained by the authors for various materials are given in two tables and are used in the study and calculations. The concept of three-stage detection is discussed. No action is taken in response to the first signal, "attention"; on the second, "action," a check is made of the night lights and of the personnel; on the third signal, "alarm," evacuation is begun, the fire department is called, and emergency measures to extinguish the fire are initiated. The first signal can be transmitted with a delay of 60 sec, the second of 30 sec, but no delay can be tolerated on the third signal. Depending on the materials found in the premises, signals are transmitted at various smoke concentrations. Data are presented on an experimental determination of smoke concentration and detection threshold levels at various locations in the telephone network. The development of a new smoke detector, the Vesda, is reported, which operates according to this three-stage detection principle. Compensation is used in the detector, taking into account the smoke concentration in the outer air, thus making it possible to reduce the number of false alarms. 3 figs, 2 tables. (RZh)

1632. Lay D

NEW CONCEPT FOR FIRE DETECTION AND SUPPRESSION

Rev Tech Feu; 17(154):36-40, 1976 (French)

Problems connected with increasing the reliability of automatic fire detection and extinguishing systems and reducing the number of false alarms are reviewed. Despite the fact that reducing the reliability of a system makes the system less suitable for use, complete elimination of false alarms is hindered by the economic aspects of the problem. To reduce the number of false alarms it is proposed that systems consisting of several (no fewer than two) independent fire detectors and a corresponding number of logic and signal circuits be used. The optimum is to use different types of fire detectors in one system. Smoke, heat and infrared detectors are the types most frequently used at the present time. The infrared detectors, however, issue a rather large number of false alarms, since they may respond to the thermal radiation of lighting systems. For this reason smoke and heat detectors are preferred in the FRG, UK and Sweden to control fire-extinguishing systems, while infrared detectors are used only in special cases. It is pointed out that the present trend is not to produce fully automatic systems, but to combine them with human operation. Logic processing of incoming signals must be provided for in fire-extinguishing systems that use different detectors. For example, when a signal is received from an infrared detector, it must be confirmed by a signal from a smoke or heat detector before the alarm is sounded. The importance of choosing optimal signal transmission paths to the appropriate fire units and of ensuring minimum delays is emphasized. Specific kinds of devices and circuits are examined. Particular attention is devoted to the use of sprinkler systems, including selectively actuated sprinklers controlled by heat detectors. The use of systems with a mathematical evaluation of the quantity of extinguishants needed to extinguish the fire source in the premise being protected holds promise. If needed, it is possible to provide for re-actuation of the system. 4 figs. (RZh)

1633. Moliere G

A FRENCH STUDY ON FIRE DETECTION

Rev Tech Feu; 17(154):42-45, 1976 (French)

The article is devoted to a study of the purely technical and practical problems of designing fire detection systems. The study is based on a thorough analysis of ways and means of detecting fires. In order to design an optimal detector it is necessary to make a correct choice of all the components and assemblies with an eye toward their operating conditions. Problems connected with their suitability in various detectors are examined using individual radio parts as an example. It is pointed out that using assemblies for operation under maximum conditions increases the probability of failure of the detector as a whole. It is emphasized that in designing a fire alarm system it is necessary to have complete and comparative lists of parts and to make sure that the characteristics of the assemblies being used conform to the manufacturer's rated data. Experiments have shown that the sensitivity of a detector depends almost entirely on the type and the reliability on the assemblies. Basic requirements are formulated for fire detection systems and various fire detection systems and devices are considered in the light of these requirements. (RZh)

1634. Lay D

NOVEL CONCEPT FOR AUTOMATIC FIRE DETECTION AND SUPPRESSION

Schadenprisma; 5(1):12-15, 1976 (German)

The number of automatic fire detection and suppression systems has increased rapidly up to the present time and the number of cases of false alarms has also increased. A number of new ideas relating to technical improvement of existing systems is advanced in order to eliminate false alarms. It is proposed that premises requiring protection be equipped with dual detection loops, each being provided with the same or different types of fire detectors, depending on local conditions, while the overall design sensitivity of the system is left unchanged. In order to prevent eventual additional damage as a result of excessive discharge of extinguishants, a technical circuit to ensure timely shutoff of automatic fire-extinguishing systems after extinguishment of the fire and, in case of necessity, re-activation, is proposed. (RZh)

1635. Stolb W

SRS 150, A NEW CENTRAL FOR COMPLEX FIRE PROTECTION INSTALLATIONS

Siemens Z; 50(4):252-254, 1976 (German)

Complex fire protection systems, that is, systems with automatic and manual reporting of fires, differentiated alarms, control of fire-protection equipment and operational means as well as automatic extinguishing devices, require centrals whose capabilities are not limited to simply receiving and forwarding reports. These centrals must be suitable both for reporting and for controlling external devices without human intervention; allocation

5. FIRE PROTECTION PRINCIPLES

b. Detection and Alarm Equipment—Continued

between actuating and controlled components of the system must be freely programmable. The technical concept, structural make-up, and functioning of the Siemens 150 system are described. 2 figs. (Author)

1636. Packham DR, Gibson L and Linton M
THE DETECTION OF SMOKE IN AIR-CONDITIONED AND VENTILATED BUILDINGS
Telecommun J Australia; 25(3):261-267, 1975

This paper introduces a new concept of "early warning fire detection" for protecting air-conditioned or mechanically ventilated buildings by the use of ultra-sensitive smoke detectors in return-air ducts. Some experiments have been done with a detector that can measure down to 0.01% m^{-1} smoke obscuration in such ducts. A first-approximation theory is proposed that should permit fire protection engineers to design appropriate installations, once smoke production rates of those materials most likely to be involved in a fire have been established, and the appropriate ignition time to "alarm" assessed. A new approach to alarm levels is also presented, whereby a series of three alarms is used to deal with "suspected" fires, "incipient" fires, or "active" fires. Some information is given about the normal smoke levels of three buildings (all telephone exchanges), smoke production rates of various materials, and the size of some incipient fires. A detector device being developed by the Commonwealth Scientific and Industrial Research Organization (Australia) and Australian Post Office is briefly described. (Author)

1637. Gumbatov DO, Dzhagupov PG, Mamedov RK and Yakubov RA
POSSIBILITIES OF USING PIEZOELECTRIC CERAMICS IN FIRE ALARM SYSTEMS
Uch Zap Azerb in-ta Nefti i Khimii; Ser 9(3):98-100, 1976 (Russian)

A device is considered that can be recommended as a fire alarm. It consists of a piezoelectric transducer, the primary cell of which is connected to an a-c network (220 V). The secondary cell is charged through the communication channel to a gas-discharge indicator. The transducer is installed in the premise, the indicator at the control point. Under normal operating conditions the voltage from the transducer maintains the luminescence of the indicator. 2 figs, 2 refs. (RZh)

1638. Scheidweiler A
THE IONIZATION CHAMBER AS A SMOKE-DEPENDENT RESISTOR
VFDB Z; 25(4):140-145, 1976 (German)

The analytical relationship between geometrical parameters and measured variables was determined. Under certain boundary conditions, ie, homogeneous ionization and constant field, the calculated values are in good agreement with the measured values. The relative change in resistance, $\Delta R/R_4$, particularly in the high smoke-density region, has advantages as a measure of the smoke sensitivity over the previously used relative change in current, $\Delta I/I_4$. A linear function of the product of particle concentration and mean particle diameter can be derived by algebraic addition of the two measured variables, change in current and change in resistance. 7 figs, 2 tables, 7 refs. (Fachdok 13/0128)

1639. Guekos G, Kotyczka W and Strutt MJO
DEVICE FOR SIGNALING THE FORMATION OF SMOKE USING A PULSED RADIATION-EMITTING SEMICONDUCTOR CELL
Swiss Patent No. 570,017; Cl G08B 17/10, Appl 19 Feb 1972, Discl. 28 Nov 1975

The invention of the patent is a smoke detector with a pulsed semiconductor cell that emits electromagnetic radiation. The innovation of the invention consists in the use of a pulsed generator to supply current to the semiconductor cell and the semiconductor sensor element for the reception of the radiated pulse after it intersects the space being monitored. The use of laser or luminescent diodes in the semiconductor cell is recommended. It is noted that the new detector is characterized by its economy and reliability while retaining high sensitivity.

1640. Matoba K
SMOKE DETECTOR
Swiss Patent No. 571,259; Cl G08B 17/10, Appl 25 Oct 1974, Discl. 31 Dec 1975, Assignee: Nomi Bosai Kogyo Co, Ltd, Japan

The patented invention is a smoke detector operating on the principle of measurement of the transmission coefficient of a medium in a measurement chamber measuring 0.1 m. The chamber contains a source of ionizing radioactive or ultraviolet radiation. The inner walls of the chamber are made of a current-conducting material and are connected to a pulsed high-voltage source. The smoke particles entering the chamber are charged electrically by the ionizing radiation. When a pulsed electrostatic field is applied to the walls of the chamber, the charged smoke particles execute pulsed oscillations corresponding to the pulse modulation of the light flux incident on the photoreceiver, at the output of which pulsed electric current is developed. The photoreceiver is loaded with active resistance, the voltage from which passes through a separating capacitor to the input of an a-c amplifier, the output of which is connected to the control relay of the detector. The housing of the detector is made in such a way that light interference does not reach the measurement chamber. The detector is actuated at a smoke density corresponding to a 10% transmission coefficient on a 1-m base. The electronic circuit of the detector contains a pulse-signal generator, a monovibrator, a high-voltage pulse generator, a measurement circuit, an a-c amplifier, and a control unit to whose control circuit a semiconductor stabilitron governing the threshold sensitivity of the circuit is series-connected. The detector is supplied by a d-c source. The use of ionizing radiation and an electrostatic field in the measurement chamber promotes a reduction in contamination of the optics and an increase in the mean time between preventive maintenance of the detector. Design variants are given. 9 drawing figs. (RZh)

1641. Beyersdorf H
IONIZATION ANALYZING AIR POLLUTION, SMOKE AND FIRE ALARM DEVICE
US Patent No. 3,935,465; Cl 250/384, (G01T 1/18, H01J 39/28), Appl 11 Apr 1974, Discl. 27 Jan 1976, Priority: FRG, Application 7402420, 24 Jan 1974, Assignee: Gesellschaft fuer Elektronische Brandmeldeanlagen mbH, Hamburg, FRG

5. FIRE PROTECTION PRINCIPLES

b. Detection and Alarm Equipment—Continued

An ionization-analyzing alarm system of extreme accuracy independent of atmospheric turbulences caused by fire and of minute dimensions, ease and safety of manufacture, assembly and repairs and devoid of forced air devices is provided having an air baffle zone, a first ionization chamber with advantageously located electrodes, radioactive source and circuitry and optionally a second ionization chamber with radioactive source and an additional electrode (the central of the three electrodes serving both chambers) and with sensitivity controls. In a preferred embodiment, an ionization fire alarm signal box is described comprising an ionization measuring chamber with a tubular housing wall, electrodes mounted in the measuring chamber parallel to each other and perpendicularly to the axis of the tubular housing wall, means to apply an electric potential to the electrodes, at least one radioactive source that produces an ionization stream between the electrodes; in which structure the tubular housing wall projects in axial direction above the electrodes and supports at one of its ends a covering that permits the entry of ambient air into the measuring chamber and whose edge is fastened to the tubular housing wall, said covering being axially spaced from the adjacent electrode and creating a baffle chamber. (Author)

1642. Tabet MA
ALARM DEVICE
US Patent No. 3,938,127; Cl 340/304, (G08B 25/00), Appl 22 Jul 1974, Discl. 10 Feb 1976, Assignee: Hughes D Burton, Norfolk, VA

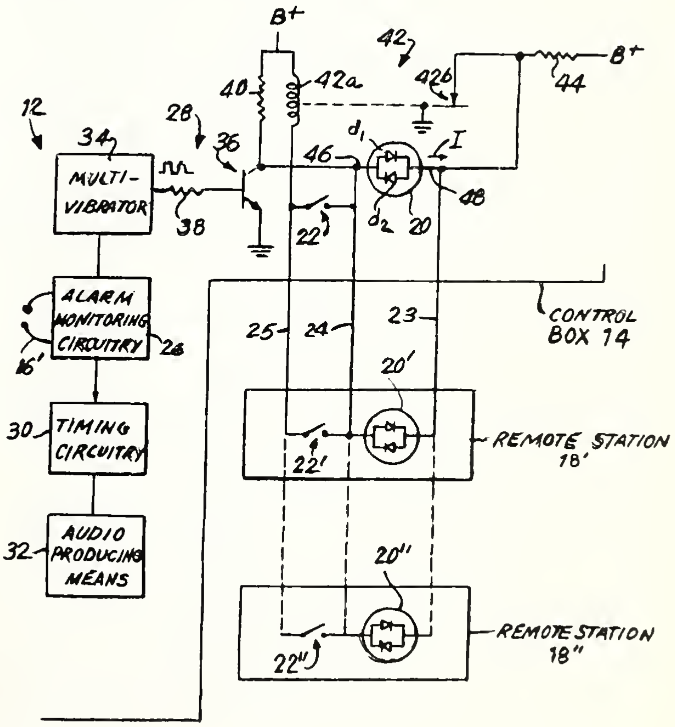
The patented device consists of an evacuated container closed by a seal connected to the actuating device (a fire alarm). When a fire alarm is initiated, the seal of the container is opened and, by means of special air passages in the container, a certain amount of air carrying the characteristic scent of the person initiating the alarm is collected. The person who initiated the alarm, if false, can be found using specially trained dogs.

1643. DeLime TL
THREE-WIRE DETECTION CIRCUIT
US Patent No. 3,978,461; Cl 340/227 R, (G08B 17/06), Appl 12 May 1975, Discl. 31 Aug 1976, Assignee: Firetek Corp, Clifton, NJ

A three-wire circuit for supplying electrical power to active, power-consuming detection devices and communicating electrical signals providing supervisory information and fire-alarm information to a control panel is proposed. Two wires supply electrical power, the third carrying supervisory and alarm signals. Passive non-power-consuming detectors may also be utilized on said circuit. Detection devices switch the positive power to he signal wire in the event of an alarm and an end-of-line device switches the negative power to the signal wire through a current-limiting device as a supervisory signal when conditions are normal. The end-of-line device measures the voltage on the power supply wires and opens ts switch when the voltage falls below a specific level o indicate trouble. The circuit can carry an alarm signal n spite of and overriding a supervisory signal. 9 claims, 5 drawing figs. (Author)

1644. Simon T
ALARM SYSTEM INCLUDING REMOTE SIGNALLING MEANS
US Patent No. 3,978,466; Cl 340/274 R, (G08B 13/08), Appl 22 Sep 1975, Discl. 31 Aug 1976

An improved alarm system is disclosed which includes one or more remote stations. Each remote station is connected to the central or control station by only three conductors or leads. The control and remote stations each include a pair of back-to-back LED diodes, the diodes of each pair emitting a different color light when current flows therethrough. The control and remote stations each also include a key switch that is operative to "enable" and "disable" the alarm circuitry at the control station. By controlling the direction as well as the wave shape of the currents passing through the LED diodes, four different visual signals may be provided at the control and remote stations to indicate the status of the alarm system. Actuation of any of the key switches reverses the current through the LED diodes so that the different colors are indicated when the alarm system is "enabled" or "disabled." Pulsing means is provided at the control station for producing either a constant current through the LED diodes when an alarm condition does not exist, or a pulsed current when an alarm condition is generated. The current in each direction can be pulsed through the LED diodes so that each pair of back-to-back diodes can emit four distinguishable visible signals indicative of different conditions of the alarm system. A fifth indication may be provided by essentially the same circuitry when a parallel delay loop is provided in addition to the main loop to indicate the condition of the delay loop. 13 claims, 4 drawing figs. (Author)



5. FIRE PROTECTION PRINCIPLES

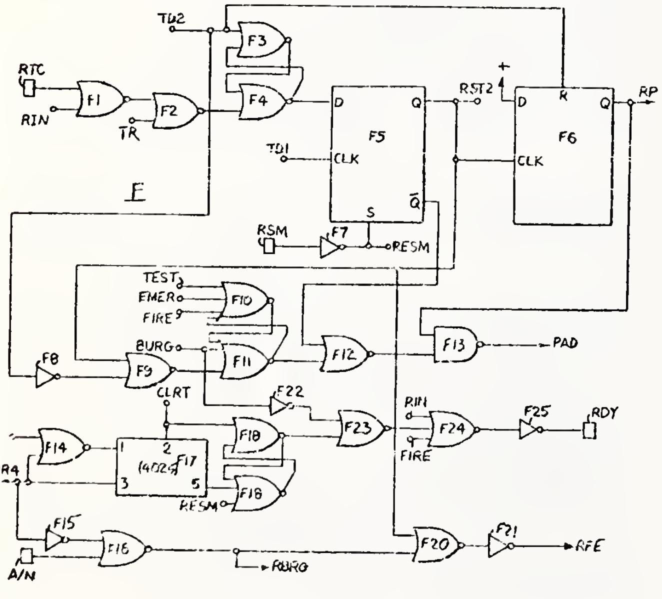
b. Detection and Alarm Equipment—Continued

1645. Schmitz LS
SOLID-STATE SECURITY SYSTEM
US Patent No. 3,978,479; Cl 340/420, (G08B 19/00), Appl 29 May 1975, Discl. 31 Aug 1976, Assignee: Westinghouse Electric Corp, Pittsburgh, PA

A security system adapted for monitoring fire, intrusion, and other alarm conditions uses solid-state technology to appropriately identify the monitored alarm conditions and initiate appropriate responses. A "one chip" integrated semiconductor circuit functions as the primary electronics of a master control console to accept both remotely initiated and locally initiated input signals and to process the signals and initiate appropriate control and alarm signals. Included on the integrated semiconductor circuit are a digital noise generator circuit, input comparator and latch circuits, system test and reset circuits, and logic circuits for developing digital output signals to both activate monitoring channels and identify the type of alarm condition present. 14 claims, 33 drawing figs. (Author)

1646. Schmitz LS
RESET CIRCUIT FOR A SECURITY SYSTEM
US Patent No. 3,978,478; Cl 340/420, (G08B 19/00), Appl 29 May 1975, Discl. 31 Aug 1976, Assignee: Westinghouse Electric Corp, Pittsburgh, PA

A solid-state reset circuit responds to the actuation of a single manual device to both transmit reset signals to the input circuitry associated with fire and intrusion sensors of a security system, and to transmit an arm/disarm signal to the intrusion sensor circuitry if an intrusion alarm condition is present and a fire-alarm condition is not present. The use of a single manual device to generate both the reset and arm/disarm signals reduces operator confusion. 3 claims, 37 drawing figs. (Author)



1647. Matveev AV, Marasanov AI, Kunitsyn VA, Mazurenko VA, Strebkov DS and Unishkov VA
FIRE-ALARM TRIGGERING DEVICE
USSR Patent No. 489,132; Cl G08B 17/12, Appl 4 Apr 1974, Discl. 30 Jan 1976

A triggering device is proposed for fire alarms to ensure fire and explosion safety in the pyrotechnic industry for the manufacture of combustible and explosive mixtures, rocket fuels, rocket-launcher systems, closed technological apparatus, etc. The aim of the invention is to increase the operating reliability of the device; to increase the current strength at the output of a photoelectric converter to a value corresponding to actuation of the control element; to ensure controllable sensitivity, selectivity, and resistance to noise generated by background and continuous light radiation sources; and to exclude external electric power sources. The device contains a thyristor with cathode connected to one terminal of the control element and a photoelectric converter. In order to simplify the device, it contains a potentiometric RC circuit with a series-connected variable capacitor. The other terminal of the control element is connected to one terminal of the photoelectric converter and to an RC-circuit connected to the control electrode of the thyristor, the anode of which is connected to the other terminal of the photoelectric converter. 1 drawing fig. (RZh)

1648. Suminski G, Riemer O and Hankey F
INTEGRATED FIRE AND OVERHEAT DETECTION SYSTEM. McGraw-Edison Co, Edison Electron Div, Manchester, NH; AFAPL TR-76-64, 323 pages, Jun 1976
Availability: NTIS AD-A032 304/8GA

This report describes the background, specifications, design, development, construction and evaluation of an airborne integrated fire and overheat warning system known as the IFOS. It was built to illustrate the possibility of providing fire and overheat detection capability with a high degree of reliability. The IFOS consists of six ultraviolet flame detector heads, two overheat-sensing thermistor cables, a central computer unit, a crew readout unit to indicate fire and overheat conditions, a maintenance warning unit to indicate component failure. The system is self-testing to an important degree and completely automatic in operation. Three such systems were constructed and extensively tested. Tests included operation under various conditions of input voltage, temperature and attitude. Response times to fire and overheat conditions were measured, and one system was subjected to vibration, shock, humidity, salt spray and electromagnetic interference tests. In addition, a theoretical study of reliability was made. While the above tests uncovered a number of design weaknesses, all of these defects could be overcome in designing an improved model of the IFOS. It is concluded that a high-reliability, automatic fire and overheat detection system is definitely feasible. (Author)

5. FIRE PROTECTION PRINCIPLES

b. Detection and Alarm Equipment—Continued

1649. Hertzberg M and Litton CD

MULTIPOINT DETECTION OF PRODUCTS OF COMBUSTION WITH TUBE BUNDLES. TRANSIT TIMES, TRANSMISSIONS OF SUBMICROMETER PARTICULATES, AND GENERAL APPLICABILITY. Bureau of Mines, Pittsburgh Mining and Safety Res Center, Pittsburgh, PA; BuMines RI-8171, 47 pages, Sep 1976
Availability: NTIS PB-259 472/9GA

A new detection methodology was evaluated – the pneumatic, sequential sampling of many points in a system through branching tube bundles that lead to a single analytic station of high sensitivity, reliability, and convenient location. The alternative method requires a large number of individual sensors. The tube bundle method is generally applicable to many industrial or commercial detection problems, but this Bureau of Mines study concerns its use as a sensitive and reliable detector of mine fires. Two serious limitations inhibit its use: the relatively slow response times for long lengths of narrow sampling tubes and the wall-diffusion losses for submicron smoke particulates. These limitations were quantitatively evaluated by measuring tube transit times and smoke particulate transmissions as a function of tube length, diameter and pressure drop.

1650. McKee RG and Alvares NJ

THE RESPONSE OF SMOKE DETECTORS TO PYROLYSIS AND COMBUSTION PRODUCTS FROM AIRCRAFT INTERIOR MATERIALS. Stanford Res Inst, Menlo Park, CA; NASA CR-137949, 55 pages, Apr 1976
Availability: NTIS N76-32141/3GA

The following projects were completed as part of the effort to develop and test economically feasible fire-resistant materials for interior furnishings of aircraft as well as detectors of incipient fires in passenger and cargo compartments: 1) determination of the sensitivity of various contemporary gas and smoke detectors to pyrolysis and combustion products from materials commonly used in aircraft interiors and from materials that may be used in the future; 2) assessment of the environmental limitations to detector sensitivity and reliability. The tests were conducted on three groups of materials by exposure to the following three sources of exposure: radiant and Meeker burner flame, heated coil, and radiant source only. The first test series used radiant heat and flame exposures on easily obtainable test materials. Next, four materials were selected from the first group and exposed to an incandescent coil to provide the conditions for smoldering combustion. Finally, radiant heat exposures were used on advanced materials that are not readily available.

1651. Habercom GE, Jr

FIRE ALARMS AND FIRE DETECTORS (CITATIONS FROM THE NTIS DATA BASE). Nat Tech Inf Service, Springfield, VA; NTIS PS-76/0873/0GA, 162 pages, Nov 1976
Availability: NTIS

The design, testing, and applications of fire detection and fire alarm systems are investigated in these Government-sponsored research reports. The majority of reports are concerned with civilian fire protection methods. However, aircraft, aerospace, and military applications for fire detection are included. (This updated bibliography contains 157 abstracts, 37 of which are new entries to the previous edition.)

1652. Habercom GE, Jr

FIRE ALARMS AND FIRE DETECTORS (CITATIONS FROM THE ENGINEERING INDEX DATA BASE). Nat Tech Inf Service, Springfield, VA; NTIS PS-76/0874/8GA, 157 pages, Nov 1976
Availability: NTIS

The design, testing, and applications of fire detection and fire alarm systems are investigated in these reports gathered from a worldwide literature survey. The majority of reports are concerned with civilian fire protection methods. However, aircraft, aerospace, and military applications for fire detection are included. (Contains 150 abstracts)

c. FIRE AND EXPLOSION RISKS

1653. Anon

BATTERY CHARGING: HAZARDS AND PRECAUTIONS
Fire Prev; (116):16-19, 1976

Battery charging fire risks include explosible hydrogen gas and electrical hazards, as shown by seven case histories of fires. These dangers can be lessened by suitable precuations, such as fire-resisting construction, ventilation, electrical protective devices, and regular inspection and maintenance. 3 photos.

1654. Green WS

FIRE RISKS IN INTENSIVE CARE UNITS AND OPERATING THEATRES: EVACUATION OF SURGICAL PATIENTS
R Soc Med Proc; 69(8):603, 1976

In this summary of a paper presented at the March 5, 1976 meeting of the Royal Medical Society (UK) hospital fire injuries and fatalities are cited in support of fire protection measures on the part of the medical staff. It is of paramount importance that contingency plans be provided for the evacuation of surgical patients.

1655. Pchelintsev VA and Fedorov AV

EXPLOSION HAZARDS OF PLANTS OF THE CHEMICAL INDUSTRY
Zh Vses Khim O-va; 21(4):416-420, 1976 (Russian)

The literature pertaining to assessment of the explosion and fire hazard of chemical plants is reviewed. Factors decisively influencing the possibility of formation of explosion-hazardous vapor-air mixtures in a local volume of an enclosure are generalized. Analytic relations are given for determining the area of free overflow and the rate of evaporation of liquids. Also given is a coefficient that takes into account the nature of the spread of vapors in the ambient air of production areas. 14 refs. (Author)

d. FIRE LOADS

e. HEAT AND PRESSURE LOAD EFFECTS ON STRUCTURES

1656. Becker JM and Bresler B
REINFORCED CONCRETE FRAMES IN FIRE ENVIRONMENTS
ASCE Proc. J Struct Div; 103(ST1):211-224, 1977

In modeling the fire response of reinforced concrete frame structures, the heat-flow problem was separated from the structural analysis and two computer programs were written for solving the separate problems. Both programs account for the temperature dependence of the thermal and mechanical properties of materials; the structural analysis accounts for the degradation of concrete and steel through cracking, crushing, spalling, and yielding. FIRES-T (FIre REsponse of Structures – Thermal) evaluates the thermal response of reinforced concrete elements using a nonlinear finite element approach coupled with time-step integration. Using the thermal histories predicted by FIRES-T, FIRES-RC (FIre REsponse of Structures – Reinforced Concrete Frames) evaluates the structural response of reinforced concrete frames by a nonlinear, direct stiffness method coupled with time-step integration. An iterative approach is used within time steps to find deformed shapes which result in equilibrium between forces associated with external load and internal stresses and degradation. 9 figs, 20 refs. (Author)

1657. Gavrikov N
FIRE ENDURANCE OF SHIP BULKHEADS
Pozhar delo; (8):26-27, 1976 (Russian)

The author presents a brief report on the experiments that were performed in testing various bulkheads. The tests were carried out with double-walled partitions made of fire-resistant materials (asbestos silicon carbide, asbestos board, fiberglass, and mineral acoustic and thermal insulation panels). The data from the tests are compiled by material, wall thickness, insulation material, etc. (Fachdok 13/0283)

1658. Nizamuddin Z and Bresler B
FIRE RESPONSE OF REINFORCED CONCRETE SLABS.
Univ of California (Berkeley), Dept Civ Eng; UCB FRG WP77-1, 38 pages, 12 figs, 2 tables, 21 refs, Mar 1977

A mathematical procedure is described for predicting displacement and stress histories of reinforced concrete slabs in fire environments using a computer program, FIRES-SL (FIre REsponse of Structures – SLabs). The temperature distribution histories used in FIRES-SL are obtained either from experimental results or from a one-, two-, or three-dimensional thermal analysis based on selected fire models. In a fire environment, thermal gradients and dilatation are sources of internal stress from local restraints within the slab and global restraint from the overall structural system. Structural response is determined in terms of displacements, internal forces, stresses and strains in concrete and steel reinforcement, and current states of concrete (cracking and crushing) and steel reinforcement (yielding). FIRES-SL uses a nonlinear finite-element approach coupled with time-step integration. Within time steps, an iterative approach is used to find a deformed shape that results in equilibrium between forces associated with external loads and internal stresses. The solution method is general and can be used for any specified slab shape, specified boundary conditions, and placement of reinforcement. Stresses in the direction normal to the slab surface are not considered. Therefore, material behavior models are developed for a state of biaxial plane stress for concrete and for uniaxial stress for steel. These models account for dimensional changes caused by temperature differentials, changes in mechanical properties of materials with changes in temperature, increased rates of shrinkage and creep with an increase in temperature, and degradation of elements by cracking in different orientations, crushing, and yielding. Numerical solutions are compared to available experimental results. Comparisons between solutions from computer program FIRES-SL and experimental results show that predicted response is accurate to within 5 to 15% of observed behavior. These verifications of computer solutions by experimental results indicate that the proposed method of analysis is a valid and powerful tool for predicting the response of reinforced concrete slabs under fire conditions. (Author)

f. PREVENTION AND HAZARD REDUCTION

1659. Threadgold GM
THAT CRASHED CAR MAY BE LPG-FUELLED
Fire Eng J; 36(103):7-12, 1976

In view of the dangers inherent in the involvement of LPG (liquefied petroleum gas) fuelled vehicles in collision or fire, the author has written a two-part article on the problem in the hope of aiding fire prevention officers asked to give advice or make requirements concerning such installations. Examined in the first part of the article are the basic components and functions of a typical LPG fuelled vehicle. Part two of the article is concerned with the storage and dispensing equipment associated with LPG fuelled vehicles. 4 figs, 5 refs.

1660. Fardell PJ and Houghton BW
GAS-FREEING AVIATION FUEL STORAGE TANKS
Fire Eng J; 36(103):13-15, 1976

Before any maintenance can be started in large aviation fuel tanks, all traces of fuel must be removed. A new gas-freeing technique involving the use of natural and mechanical ventilation, together with an air-driven pump for removal of liquid residues from the irregular bottom of the tank, is described. Measurements were made of gas concentrations, both by the use of portable gas detectors and by sampling for laboratory analysis, to determine what took place during the operations. The portable gas detectors were found to underestimate gas concentrations. 9 figs, 1 table.

1661. Lucazeau C
MACHINERY AND APPARATUS FIRES
Ind miner mine; (2):71-74, 1976 (French)

The particular fire hazard features of mining equipment, the nature of the outbreak and development of fires in underground workings, fire-extinguishing principles, principles of preventing fire spread, and fire prevention measures are described. 2 figs. (RZh)

5. FIRE PROTECTION PRINCIPLES

f. Prevention and Hazard Reduction—Continued

1662. Anon

SELECTING FIRE-RESISTANT FLUIDS

S Afr Min Eng J; 88(4112):61,64, 1976

The most commonly used fire-resistant hydraulic fluids, *viz* water emulsion, water glycol, phosphate ester, and petroleum, are briefly discussed and compared as to fire resistance qualities, lubricity and temperature limits. It is recommended that in selecting a fire-resistant fluid, the customer work closely with the fluid manufacturer, who will match equipment need with fluid capabilities. 1 table.

1663. Wedel W, von

FIRE PROTECTION FOR UTILITY SHAFTS AND DUCTS

SBZ; 31(5):366,368, 1976 (German)

A report is made on the many disasters which are connected with fires in shafts and ducts in modern buildings, including the ducts of ventilation and air-conditioning systems, garbage disposal chutes, etc. The cause of these fires is the failure to observe the fire-protection standards. In accordance with German standard DIN 4102, ducts and shafts should be made of noncombustible (Class A) materials. The same requirements are imposed on linings, paints and protective coatings within conduits. In the instructions for the use of construction materials in surface construction it is stated that the fire endurance of buildings of up to five stories must be not less than 30 min, not less than 60 min for midrise buildings up to 22 m, and 90 min for highrises above 22 m. The design of conduits by the Promat GmbH with walls made of double-layered Promabest, sheets with aluminum foil as the heat reflector or fire-retardant insulating wool between the layers, is described. The advantage of such structures is that they do not deform, so that they can be used to remove aggressive gases. They are easily dismantled for maintenance purposes, are lightweight, are insensitive to moisture, and can be cemented with Meltach tile. (RZh)

1664. Wakabayashi K

FIRE AND EXPLOSION PREVENTION TECHNIQUES

Soda to enso; 27(2):37-50, 1976 (Japanese)

Some interim results are presented of long-range laboratory investigations being carried out by the Fire Engineering Institute in Tokyo since 1971 and of methods aimed at the development and continuous updating of specific recommendations on increasing fire safety in various branches of industry and in households. In particular, the data being reviewed contain, in graphic and table form, precise values of ignition temperatures, fire-hazardous concentrations, values of critical pressures and other parameters of a number of chemically pure substances and their compounds widely used in modern industrial production. Analytical and empirical formulas are presented, forming the mathematical research tool; also given is a detailed description of the program methods and of the laboratory test setups used during these investigations. 29 figs, 6 tables, 15 refs. (RZh)

1665. Strizhevskiy II

PREVENTION OF FIRES AND EXPLOSIONS DURING SUDDEN DISCHARGES OF CHEMICALS

Zh Vses Khim O-va; 21(4):388-395, 1976 (Russian)

Methods are considered of ensuring fire and explosion safety during the discharge of hot gases and vapors from safety valves when equipment is depressurized, chemicals shoot out of high-pressure apparatus, tanks rupture and combustible liquids are spilled. Examples of accidents are given. 1 table, 20 refs. (Author)

1666. El'natanov AI

FIRES AND EXPLOSIONS IN CHEMICAL PLANTS

Zh Vses Khim O-va; 21(4):402-408, 1976 (Russian)

Considered are the most typical fires and explosions in chemical and petrochemical plants, their causes and effects. Practical recommendations are made as to the storage of fire-hazardous chemicals. Aspects of the fire protection of chemical plants, the sequence of fire-fighting actions, and the particular features of fire protection of production machinery are examined. Special attention is paid to problems of preventing fire, explosion and accident losses in the early stages of developing production systems. Examples of design-stage solutions relating to the location of fire-hazardous equipment in oil-processing plants and fire-prevention measures during the operation of chemical and petrochemical plants are cited. 1 table, 16 refs. (Author)

1667. Orlov GG

PREVENTION OF DESTRUCTION OF BUILDINGS DURING EXPLOSIONS IN CHEMICAL PLANTS

Zh Vses Khim O-va; 21(4):409-416, 1976 (Russian)

A brief review is given of the statistical, standards and research literature, both Soviet and foreign, relating to the prevention of building destruction in case of explosions in chemical plants. The results of an analysis of accidents that occurred during the operation of buildings with explosion-hazard processes are given, and a critical evaluation is made of the use of existing standards literature and design solutions for explosion protection. The existing relations for the determination of required areas for the readily fragmenting elements of barrier structures are analyzed. 4 figs, 1 table, 22 refs. (Author)

1668. Rogers SP

PRELIMINARY EXPERIMENTATION ON THE SPRINKLER PROTECTION OF CARPETS IN STORAGE. Fire Res Sta, Borehamwood, UK; Fire Res Note 1061, 37 pages, 12 figs, 13 tables, 5 refs, Nov 1976

With the increasing concern shown by carpet manufacturers and insurance companies on the fire protection of rolled carpets in storage, a series of experiments were carried out by the Fire Research Station (FRS). The initial small-scale work on a selection of rolled carpet samples enabled the least and most flammable carpets to be selected for simulated full-scale experiments in an open rack to study the effectiveness of sprinklers in controlling the fire. These experiments showed that conventional in-rack sprinklers with a sufficiently high rate of water application would probably only prevent damage to building and racking. The fire hazard presented by the two carpets varied to such an extent that further work is necessary to enable a relationship to be established between the rate of water application (water density) required and the types of carpet stored. This would then allow sufficient sprinkler protection to be given to the type of carpet and ensure maximum fire control. Further work is also required on simulated full-scale closed racks to study the burning characteristics of the carpets and the sprinkler protection required in this type of storage. (Author)

1669. Bamert E and Kaiser J

FIRE-PROTECTION SYSTEMS IN THE SERVICE OF HUMAN PROTECTION

Fire Protection Seminar, Internat, 5th, Papers, Vol 2; 1976, Sep 22-24, Karlsruhe, FRG, pages 23-38 (German)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

The aim of this paper is to consider automatic fire-alarm and extinguishing systems as well as automatic smoke and heat vents for their suitability in reducing hazards to humans. But the protective value of fixed extinguishing and automatic alarm systems cannot be evaluated without taking into account the purpose of the building and its structure as well as the fire process to be expected, which will differ in accordance with the kind of building and its contents. For this reason an attempt is made to formulate these sets of problems and their interrelationships and then to summarize the specific points of danger for humans. 4 figs, 6 refs. (Author)

g. PROTECTIVE DEVICES AND EQUIPMENT

1670. Martell PJ

WATER-FILLED FIRE PROTECTION SYSTEMS AT EKOFISK

Offshore Technology Conf, Annual, 8th, Proc, Vol 2; 1976, May 3-6, Houston, TX, pages 417-428
Sponsor: AIMMPE, AAPG, AIChE, ASCE, ASME, IEEE, et al

Tubular steel structures, including entire jackets and deck sections of template-type platforms, can be protected against fire exposure by keeping the structural members full of water. The heat of the fire is absorbed by the water. Pressure from the fire water pumps, stream pressure from the evaporation of water, natural convection, or any combination thereof, will cause the water to circulate through a system of intercommunication openings. Steam and/or hot water vented from the system will be replaced with colder water from the fire pumping system. The temperature of the steel is thereby maintained at a safe level for structural integrity. This concept and how it was applied to specific structures in the Phillips Norway Group acreage of the Norwegian North Sea is discussed. 7 figs, 3 refs. (Author)

1671. Barnard HD, Gilbreth EW and Murhall CC

HEAT SHIELD WALLS ON LIVING QUARTERS, INSTALLED ON DRILLING AND PRODUCTION PLATFORMS AT EKOFISK — NORWEGIAN NORTH SEA

Offshore Technology Conf, Annual, 8th, Proc, Vol 3; 1976, May 3-6, Houston, TX, pages 1129-1148
Sponsor: AIMMPE, AAPG, AIChE, ASCE, ASME, IEEE, et al

It is concluded in this paper that the safety of personnel resident in a living quarters module on an offshore installation during production well drilling, completion, wire lining, and field production can be greatly improved by the installation of the heat-shield wall on the inboard side of the quarters. This concept is gaining wide acceptance by authoritative bodies. The significance of the study is that it has developed, in a rudimentary fashion, a tool for predicting the mechanics and consequences of certain platform disasters as well as of developing a form of construction to meet these events, should they occur. This construction is now an established form of protection by Phillips Petroleum Co for all new permanent quarters in the Norwegian North Sea. 23 figs, 3 tables, 5 refs. (Author)

1672. Gertis K and Werner H

CONDUCTION OF HEAT AND MOISTURE TO THE UNDERSIDE OF SHELTER CEILINGS IN THE CASE OF FIRES

Bautechnik; 53(10):326-328, 1976 (German)

Calculation formulas are developed in order to determine how severely shelter occupants are affected by heat and moisture during fires directly above the shelter. The total heat-transfer coefficient is made up of the convective component, the radiation component, and the moisture heat-transfer coefficient. In previous calculations the latter was neglected, but it is demonstrated in this article that this coefficient surpasses the other two components by orders of magnitude. For the heat-transport mechanism this means that the shelter air is not heated, but that the colder upper parts enclosing the shelter are heated by condensation of moisture on them. 6 figs, 3 refs. (Fachdok 13/0177)

1673. Saito K and Wada T

EQUIPMENT TO APPLY ELECTROSTATIC FORCE TO REMOVE SMOKE DURING FIRES. MODEL EXPERIMENTS

Boei Daigakko Rikogaku Kenkyu Hokoku; 13(3):299-308, 1975 (Japanese; English Summary)

The results of laboratory investigations of a method of removing smoke from premises by generating a powerful electrostatic field are presented. The effectiveness of using this method in conjunction with electrodes of varying configuration is studied. The principal feature of the method is that soot and carbon particles, the major components of smoke, are positively charged ionized particles, cations, which are effectively attracted and precipitated on electrodes having a sufficiently high negative electrostatic potential. The design and operating principle of the laboratory setup used in the investigations are described. A rigorously controlled quantity of smoke is passed into a rectangular chamber measuring 300 x 400 x 150 cm. The chamber walls are made of a transparent synthetic material. The electrodes being tested (of varying configuration) are placed on a special stand in the chamber; the control panel for the arrangement made it possible to regulate the magnitude of the applied electrostatic potential in the range of 0-30 kV. Several electric lamps are mounted on one side of the chamber (on the outside); the lamps have a highly stable illuminating power. On the other (opposite) side of the chamber is a set of phototransistors reacting to the intensity of the light beams passing from the calibrated lamps through the entire smoke-filled chamber. Thus, the amount of smoke in the chamber was varied by varying the density. The output device that processes and records the information coming from the phototransistors is synchronized with the time counter. The rate of smoke removed from the chamber per unit time was measured by this method. The distribution of the smoke medium in the chamber was kept uniform by means of a two-bladed fan. It was found that at an electrostatic field intensity of 5.7 kV/cm the speed of the smoke particles reaches 2.2 m/sec and the chamber is completely cleared of smoke in 15-30 sec, depending on the amount of smoke and the effectiveness of using electrodes of varying configuration. 8 figs, 6 refs. (RZh)

1674. Lambie HR
THE ROLE OF VENTILATION IN FIRE PROTECTION
Build Serv Eng; 43(2):A11-A12, 1976

A smoke-filled building must be opened to let smoke out and firemen in, but the act of opening it may add the oxygen which will destroy it. This is one of the reasons why fire officers encourage the use of automatic venting early enough in the fire to prevent any accumulation of unburned CO and to remove continuously the heat and smoke rising from the fire. The research history of ventilation systems, relevant publications, benefits, and equipment are discussed. 2 figs. (Author)

1675. Tominaga S and Kobayashi K
MEASURES ON ELEVATORS IN CASE OF POWER FAILURE, FIRE AND EARTHQUAKE
Densetsu kogyo; 22(1):47-52, 1976 (Japanese)

A brief survey is made of methods used in Japan to prevent passenger elevators from losing power from a commercial-frequency network and to protect them from fires and from damage resulting from earthquakes and local seismic events. The design, technical characteristics and specifications of several mass-produced models of self-contained power-supply systems to be used as a backup for highrise passenger elevators are given. The principal components of the self-contained power-supply systems are remote-controlled, gas-powered electric generators of varying power. A recommended block diagram is given for the control system of several passenger elevators in one highrise building which will provide for automatic actuation of the generator in case the main power supply is lost for various reasons. Considered as the active fire-protection means are fully automated sprinkler extinguishing systems produced in various modifications as a function of the geometric configuration and dimensions of the elevator shaft. In addition, a brief report is given of some new incombustible materials used for finishing elevator cabins. In order to enable passengers to escape from elevators in case they become stuck as a result of seismic events, one of the walls of the elevator shaft is made of easily dismantled (from the outside or inside) unitized panels with special mechanical catches. The corresponding wall of the elevator cabin can also be dismantled. 4 figs, 3 tables. (RZh)

1676. Butcher EG, Parnell AC and Eastham G
SMOKE CONTROL BY PRESSURIZATION
Fire Eng J; 36(103):16-19, 1976

Described in the article is a full-scale fire test carried out in an office building in Hamburg, FRG, which has six floors above the ground and a basement. Pressurization was the means of ensuring that the lobbies and stairs could be kept clear of smoke. The fire test was carried out under conditions which completely similated the behavior of the finished building. The fire tests, conditions, and building instrumentation are described. The installation was completely successful in keeping the escape routes clear of smoke; in addition, the fire itself, because of the venting by vertical shafts, developed an air flow condition that markedly assisted the pressurization system. 4 figs, 1 table, 5 refs.

1677. Anon
SOME OF THE NEW DEVELOPMENTS IN THE STRUCTURAL FIRE PROTECTION FIELD
Fire Prot Rev; 40(435):23,25,28, 1977

An entirely new half-hour fire check partitioning system claimed to have the advantage of low cost and quick erection combined with high fire-resistance characteristics and good sound insulation is described. Called the Clifford "Pyrophonic" (Clifford Partitioning Co Ltd, New Malden, Surrey, UK), the partition is based on a specially designed, precision-fabricated stud forming a 73-mm wide demountable internal frame. Standard infill panels are plasterboard to Class "O" surface spread of flame, but a variety of decorative finishes in vinyl, cloth, laminate, or timber-veneered panels is also available. Various other developments in the structural fire protection field are given. (Author)

1678. Kawamura T
A NEW VENTILATION SYSTEM TO EFFECTIVELY ELIMINATE FIRE SMOKE IN A TUNNEL
Kosoku doro to jidosha; 19(4):30-35, 1976 (Japanese)

The types and operating principles of the powerful fixed ventilation systems used in Japan in highway and railway tunnels are briefly reviewed. These systems are designed for continuous or periodic operation to maintain normal micro-climatic conditions, especially fresh air supplies, in a relatively isolated tunnel volume. As a rule these systems are not designed to remove smoke from the tunnel during a fire. The new system, whose structural features and operating principle are described in detail, is all-purpose and is designed to remove smoke from the tunnel in case of fire as well as to perform its principal air-handling function. The results of experimental tests of the system in the 1,943-m long Kobekati highway tunnel are presented. The results verify the high efficiency of the system: in the maximum operating mode the system removed smoke (various smoke charging levels were simulated several times during the tests) at a rate of up to 40 m^3/sec. The test results are given along with the aerodynamic characteristics of the Kobetaki tunnel. 6 figs, 2 tables, 5 refs. (RZh)

1679. Anon
TECHNICAL SPECIFICATIONS FOR ILLUMINATED EMERGENCY SIGNS
Ohm: denki zasshi; 63(3):282-295, 1976 (Japanese)

Given are the technical specifications governing the physical and structural parameters of emergency light indicators designed to inform people of the location of emergency exits, evacuation routes, emergency communication devices, fire extinguishing equipment and first-aid means

5. FIRE PROTECTION PRINCIPLES

g. Protective Devices and Equipment—Continued

to be used in extraordinary situations, such as fires and the like. Several varieties and models of indicators are analyzed, differing in purpose, size, shape of script, and power of the light sources illuminating the indicators from the inside (all the light indicators reviewed in the specifications and recommended for use are fluorescent lamps of from 100 to 1000 W). Also governed by the standards are sizes for indicators located in corridors, stairwells, and elsewhere in buildings. It is noted that light signals mounted flush with the surface of the floor and ceiling of premises are highly advantageous with respect to biotechnical parameters and the resultant psychological effect. Recommendations are made as to the arrangement for connecting light-signal commutation and supply circuits to fire-alarm circuits forming complex fire protection systems. The recommendations were worked out by the Standardization Group of the Japanese Ministry of Construction. 7 figs, 5 tables. (RZh)

1680. Anon

TECHNICAL SPECIFICATIONS FOR ELECTRICAL ADAPTER EQUIPMENT

Ohm: denki zasshi; 63(3):306-308, 1976 (Japanese)

Technical specifications are presented for some electrical adapter parts, in particular plug connectors used for the commutation of emergency (fire) electrical power sources, as worked out by the Standardization Group of the Japanese Ministry of Construction and recommended for introduction as national standards. A brief technical and economic description is given (chiefly from the viewpoint of fire safety) of the selection of the principal parameters being regulated: number, configuration and dimensions of the blades and jacks, respectively, in plug prongs and sockets. Four basic types of connectors are recommended: three-blade (three-pole) and four-blade (four-pole), a grounding pin being required for each of them. Each blade must be designed for current not less then 30 A. 3 figs. (RZh)

1681. Wasowski J and Kawa F

FIRE VENTILATION IN INDUSTRIAL OCCUPANCIES

Prz poz; 64(4):12-14, 1976 (Polish)

Several existing designs of fire ventilation systems used in industrial occupancies are examined and their operating principle is described briefly. In designing new types of fire ventilation systems it is necessary to take into account not only the purpose and height of the building being protected, but also the fire load, the location and height of storage of combustible materials, the theoretical rate of fire spread, the number of zones protected by fire partitions, the distance to the lower edge of the fire barrier, the possibility of air supply to remote areas, the presence of automatic fire alarm and extinguishing systems, and the time required for firefighters to arrive. It is pointed out that the manufacture and installation of a fire ventilation system requires rather large expenditures of funds. 8 figs. (RZh)

1682. Anon

SMOKE REMOVAL IN HIGHRISE BUILDINGS

Rev Tech Feu; 17(155):10-12, 1976 (French)

Given are the results of investigations aimed at preventing smoke from filling enclosures far from the one in which a fire has broken out. Experiments were performed with different designs of forced exhaust systems, including ones equipped with a revolving drum-type shutter. The preferred arrangement is to use a system in which the fire-enclosure air is evacuated, the adjacent enclosures are pressurized, and the drum-shutter is not installed. 2 figs, 4 tables, 7 refs.

1683. Hayashi T

INHIBITION OF EXPLOSIONS BY FLAME ARRESTERS. PART 5. FACTORS AFFECTING FLAME QUENCHING BY WIRE SCREENS

Sangyo Anzen Kenkyusho Kenkyu Hokoku; (24-6):1-10, 1976 (Japanese; English Summary)

Given are the results of laboratory studies of the effectiveness of flame arresters to be used in gas mains and distribution lines. The latter were simulated in the studies by long pipes supplied with an acetylene-air mixture. Three-dimensional screens were made of metal wires in the form of a multi-layer cellular structure of variable thickness (the length of the cylindrical arrester) and cell diameter. The diameter of the pipes simulating gas lines was 25.4 mm. The flame arresters were inserted to varying depths into the pipes (from the end at which the acetylene-air mixture was admitted). In this way it was possible to vary the ratio of the pipe volumes containing the ignitable mixture and, accordingly, the mixture being protected by the arrester. The mixture was ignited by electrodes mounted in the pipes and connected to piezoelectric primers. The arresters differed from each other, as mentioned above, in the diameter of the cells; the number of cells per dm (over the diameter of the arrester) was varied from 60 to 120. The following conclusions were reached: the use of arresters to prevent flame spread through the volume of the acetylene-air mixture turned out to be less effective with stoichiometric mixtures (1:1); the effectiveness increases when the distance between adjacent arresters in a unit arrangement of several arresters in succession is decreased, but there is a certain critical spacing which, if exceeded, does not increase their effectiveness. It is possible, however, to find an optimal number of arresters in sets and to determine this critical spacing for any geometric ratio of pipe and arrester size; with decreasing length of the pipe containing the ignitable mixture (and relative increase in the length of the part of the pipe containing the mixture being protected by the arrester) the effectiveness of arresters increases, indicating that the arrester should be located as close as possible to the point of ignition.

1684. Jiromaru S

EMERGENCY POWER SUPPLY SOURCES

Seisan to denki; 28(2):1-12, 1976 (Japanese)

The principal problems confronting designers of emergency electrical power sources used in conjunction with fire detection and extinguishing systems as well as to satisfy overall requirements for electrical power in case of failure of the commercial-frequency electrical network as a result of fire are analyzed for various premises. Gas-powered electrical generators, storage cells and battery sources are usually used as such emergency power sources. The main technical requirements for such sources are formulated: high operational reliability, compactness, power capacity (for the case of storage cells and battery components), maintainability (for the case of gas-powered generators), preservation of the main parameters, and non-critical duration and conditions of storage. Recommendations are made regarding optimal selection of the type of emergency power source as a function of the nature of the premise being protected. (RZh)

1685. Vandevelde P and Vuylsteke G

FIRE PROTECTION OF HOLLOW DOOR PANELS AND FRAMES BY INTERNAL SOAKING AND FILLING WITH WATER DURING A FIRE

Belgian Patent No. 758,424; Cl A62C, Appl 4 Nov 1970, Discl. 7 Jan 1976

No abstract available.

1686. Billet JL

SAFETY STAIRWELL FOR NORMAL SERVICE IN A MULTISTORY BUILDING AND FOR EVACUATION IN CASE OF FIRE

French Patent No. 2,259,203; Cl E04F 11/02, A62C 2/02, Appl 24 Jan 1974, Discl. 22 Aug 1975

A stairway is proposed (Fig. 1) for normal service and as a safe evacuation route in case of fire. The stairwell 10 (square cross section) is isolated from the rest of the building by fire-resistant walls. One quarter of the stairwell area is occupied by a landing 32 providing access to the floor via opening 11; the remaining space is occupied by spiral stairs connecting floors. If necessary, the space between floors can be closed off by means of a door 40, normally open, but closable during a fire by means of a spring or by its own weight, thus covering the door opening, but openable by humans without excessive effort. When the door covers the opening, the entire stairwell is partitioned into individual sections bounded by the landings 32, 34, the steps 30, and the door, preventing the spread of smoke up the stairwell into the upper floors. To increase the safety, the stairwell is isolated from the rest of the building in case of fire by closing off the floor opening by means of a sliding door 50 (Fig 2) which, under normal service conditions, is housed in the wall of the stairwell. The door must open easily, regardless of the pressure gradient in the building and stairwell. 2 drawing figs. (RZh)

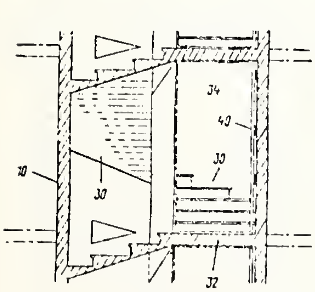


Fig. 1

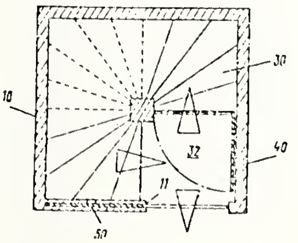


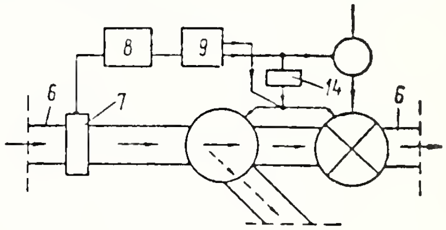
Fig. 2

1687. Zoukourian M

DEVICE FOR PREVENTION OF AND PROTECTION AGAINST FIRES AND EXPLOSIONS IN PROCESSING LINES FOR DISPERSE COMBUSTIBLE PRODUCTS

GDR Patent No. 116,755; Cl A62C 3/04, Appl 29 Apr 1974, Discl. 12 Dec 1975, Assignee: Cifal SA

The patent relates to a device for protection against fires and explosions of combustible materials circulating in a closed production line 6 (see the figure). It consists of a detector 7 that senses infrared radiation and converts it, in an appropriate shape and length, into an electric signal; an amplifier 8, which amplifies the signal to the required strength; and actuators 9, 14. When a fire or an explosion occur, the detector transmits a signal to the amplifier, which triggers the actuators, and a fluid or other extinguishants are applied to the burning section of the pipeline, localizing the fire or explosion. The actuation time is 0.1 sec. The rate of transportation of combustible materials through the pipeline is 12-25 m/sec, which means that the distance at which the extinguishant is applied is 2.5 m. Thus, all the components of the device can be compactly arranged to achieve the maximum effect of protecting a pipeline against fires and explosions. (RZh)



1688. Kojima T

FIRE-RESISTANT BETWEEN-FLOOR STRUCTURES

Japanese Patent No. 50-22,330; Cl 86(5)B211, (E04C 2/28), Appl 22 Aug 1969, Discl. 30 Jul 1975

The patent is disclosed for a fire-resistant between-floor partition, one component of which is a shaped metal layer with longitudinal recesses filled with a special granulated material, a mixture of concrete dust and a synthetic material. The distinctive features of the structure are its high fire resistance and ease of production and assembly; it is recommended for use in building premises requiring increased fire protection. The procedure for preparing the granulated material intended as a filler for the pockets (recesses) is described. 1 drawing fig. (RZh)

1689. Occleshaw JE and Smith TD

IMPROVEMENTS IN AND RELATING TO BOARD PRODUCTS

UK Patent No. 1,421,556; Cl D 2 B, (D21J 1/16), Appl 13 Mar 1973, Discl. 21 Jan 1976, Assignee: Tac Construction Materials Ltd

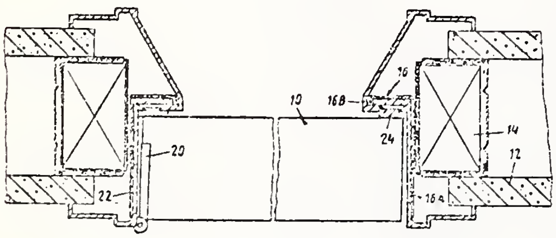
A method of manufacturing fire-rated panels intended primarily for bulkheads of ships in place of asbestos cement panels is proposed. The material consists of Portland cement, water, long and short staples of glass fiber, cellulose, and a silicic filler (diatomite). The cellulose amounts to 10 weight % and can be replaced in part by other organic fibers (polyester, polyamide, polypropylene). The cellulose increases the resistance of the panel to bending. The glassy fibers can be glass or mineral. The short staples (up to 25 weight %) must be up to 1 cm in length and must serve to prevent the panels from cracking during treatment in an autoclave. The long staples (about 2 cm), amounting to 5 weight %, increase the shock resistance. It is desirable that the glass fibers be alkali-resistant. Perlite serves as the inert filler. The component parts are mixed and dispersed in a hollander. The semiliquid mass is shaped in a rolling machine. The wet panels are exposed for three hours to air, are treated in an autoclave for 26 hours and are dried in a drying chamber for 12 hours. Examples of the formula and production details are given. The mass volume of a 2-cm panel is 640 kg/m^3 and the bending strength is 4.7 MPa. (RZh)

1690. Exell DF

FIRE-RESISTANT STRUCTURES

UK Patent No. 1,427,074; Cl E1J, (F06B 1/04), Appl 25 Jun 1973, Discl. 3 Mar 1976, Assignee: Unilock-Tenon Internat Ltd

The patent relates to a door frame to protect the outer edges of the door panel. The panel 10 (see the figure) fills the opening of the fire-resistant partition, which consists of two layers of wallboard 12. Fixed to the wooden door jamb 14 is a steel support 16 in the form of an unequal-sided channel with long (16A) and short (16B) wings, forming a projection toward the closed door. The support is enclosed by a decorative aluminum section 18 with slots for the door hinges 20 and catches. A steel plate 22 serves for additional bracing of the hinges to the frame. The shutting space is sealed with elastic plastic pads 24. In case of fire the aluminum section may melt, but the steel support will prevent spread of the fire through the door because the projection 16B fits tightly to the door panel, thus also promoting the removal of heat. 2 drawing figs. (RZh)

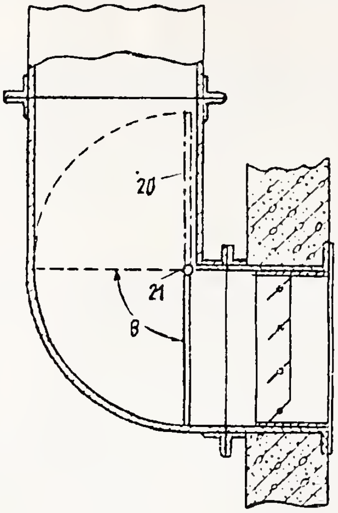


1691. Iwata Y

FIREPROOF SMOKE DAMPER

US Patent No. 3,912,223; Cl 251/299, (F16K 1/16, F23L 13/00), Appl 15 Mar 1974, Discl. 14 Oct 1975, Assignee: Nittan Co, Ltd, Japan

A highly effective smoke damper installed in the elbow of an air duct so that its axis 21 (see the figure) coincides with the center of curvature of the bend is patented. In the open position 20 the damper is restrained by a spring; it is closed by means of a pneumatic device consisting of a cylinder with a piston governed by a solenoid valve that cuts in a supply of fresh air into the cylinder. The solenoid valve is actuated when a fusible constraint inside the air duct is destroyed. 1 drawing fig. (RZh)

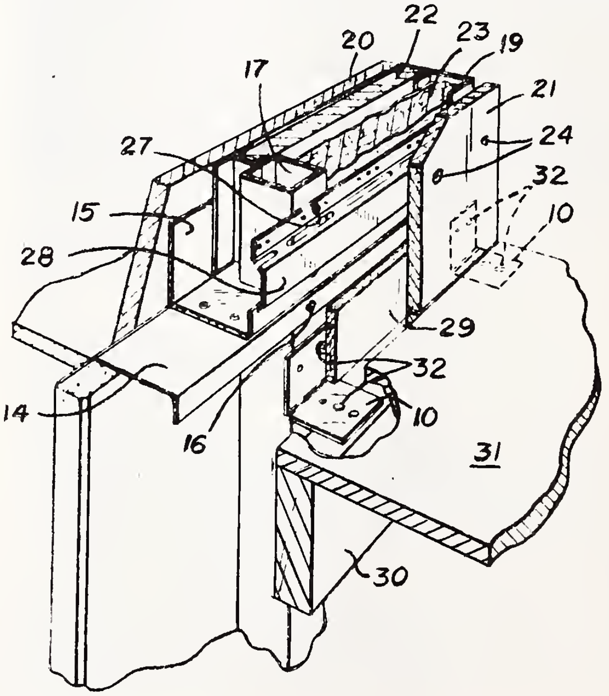


1692. Balinski HA

FIRE-RATED COMMON-AREA SEPARATION WALL STRUCTURE HAVING BREAK-AWAY CLIPS

US Patent No. 3,974,607; Cl 52/232, (E04C 2/00), Appl 21 Oct 1974, Discl. 17 Aug 1976, Assignee: United States Gypsum Co, Chicago, IL

A common-area separation wall structure for separating adjacent occupancy areas is provided having a centrally



located vertical fire-barrier member comprised of a plurality of steel studs supporting a plurality of gypsum drywall panels and wood-framed wall structures on each side of the vertical fire barrier having outer wall panels affixed thereto. The fire barrier member is supported by the wall structures on each side and affixed thereto by means of aluminum breakaway clips. In the event of a fire in one occupancy area, the heat of the flames melts the breakaway clips on that side, permitting the burning wall to separate from the vertical fire barrier member and collapse, while the vertical fire barrier member remains supported by the opposite non-burning wall, thereby preventing the fire from igniting the wall structure of the occupancy area on the other side. 7 claims, 5 drawing figs. (Author)

1693. Bogaert PEEJ
VENT CLOSURE ARRANGEMENT
US Patent No. 3,977,134; Cl 52/1, (E05F 15/20), Appl 28 Feb 1975, Discl. 31 Aug 1976, Priority: Belgium, Pat No 142,001, 14 Mar 1974

A roof vent for releasing smoke and heat from a building in the case of a fire is provided with a cover mounted on two track members for movement in the common direction of elongation of the track members that define therebetween an opening through the roof. The cover is permanently based away from the position in which it closes the roof opening but is normally retained in its closing position by a detent device that may be inactivated by temperature-sensitive apparatus in the case of a fire. The operating elements of the vent are concealed from view and protected from the elements by being arranged under the cover member. 8 claims, 7 drawing figs. (Author)

h. SUPPRESSION DEVICES AND EQUIPMENT

1694. Everett EG and Nehring G
AN APPROACH TO FIRE CONTROL IN OFFSHORE OPERATIONS IN THE NORTH SEA
Offshore Technology Conf, Annual, 8th, Proc, Vol 2; 1976, May 3-6, Houston, TX, pages 405-416
Sponsor: AIMMPE, AAPG, AIChE, ASCE, ASME, IEEE, et al

The frequency of occurrence of fires in offshore operations worldwide is low and the majority of these can be dealt with at the location by trained personnel using installed fire-fighting equipment. Nevertheless, for the hostile environment of the North Sea with its huge complex platforms, considerable effort has been directed towards resolving the problem of dealing with fires of disaster proportion by planning to have special floating equipment available in order to preserve the integrity of the large multi-million dollar structures. The total approach to fire precaution and control is discussed. Summarized in the paper are the results of some two years of committee effort by the United Kingdom Offshore Operators Association Ltd, which benefitted from worldwide experience of the oil industry, as a result of which parameters were established for the design of purpose-built fire-control vessels and proposals were made for their location and operating mode in the areas of concentrated industry activity in the North Sea. However, the approach is applicable to any area in the world where similar operating and environmental conditions prevail. 5 figs. (Author)

1695. Richards RC and Sheehan D
EXPLOSION SUPPRESSION SYSTEMS FOR MARINE APPLICATIONS
Offshore Technology Conf, Annual, 8th, Proc, Vol 2; 1976, May 3-6, Houston, TX, pages 428-436
Sponsor: AIMMPE, AAPG, AIChE, ASCE, ASME, IEEE, et al

Coast Guard Research and Development Center tests of two explosion suppression systems conducted in the forward pump room (18,000 ft^3) of the T/V RHODE ISLAND are described. The experimental suppression systems were specifically designed for the space and fabricated from existing hardware and detection equipment. They are the first systems to effectively extinguish propane-air explosions in volumes as large as 18,000 ft^3. The effectiveness of water, Halon 2402, Halon 1211, Halon 1301, and Purple K dry chemical powder as suppressing agents was evaluated. The systems were being evaluated to determine their applicability in pump rooms and other high hazard spaces on tank vessels. They could also be used in offshore well-drilling operations in spaces where gas buildup might occur, such as wellheads, storage tanks, and production platforms. The testing demonstrated that technically it is feasible to suppress explosions generated by rapid oxidation of vapor/air mixtures in large volumes. For the various extinguishing agents, the tests indicated that successful suppression requires twice as much water as Halon and approximately 10 times as much Halon as dry chemical (Purple K) by volume. The results of the work will be used as a basis for establishing criteria for evaluating explosion suppression systems that may be submitted to the Coast Guard for approval. 10 figs, 6 refs. (Author)

1696. Halpaap W
SPECIAL REMOTE-CONTROLLED FIRE APPARATUS FOR CHEMICAL PLANTS
Brandschutz; 30(11):292-295, 1976 (German)

A special fire apparatus which, as far as known, is the first of its kind to date, has been put in operation by the Bayer AG in its plant in Dormagen (FRG). The design and technical data of the prototype were tailored to the demands of chemistry. Fires in tall facilities, especially those that are difficult of access, can be handled better with this apparatus. A three-part articulated boom mounted on a suitable chassis can be extended out to 30 m and can be rotated. One operator is all that is needed to operate the boom by remote control. The technical data of the so-called articulated-boom apparatus (GLA 30) are given. It can be used as a foam or water monitor. A good idea of its performance can be obtained from photos of a demonstration exercise. 7 figs. (Fachdok)

5. FIRE PROTECTION PRINCIPLES

h. Suppression Devices and Equipment—Continued

1697. Anon

AUTOMATIC EXTINGUISHING SYSTEMS FOR ELECTRONIC FACILITIES

Brandverhuetung; (115):12-13, 1976 (German)

Owing to the high sensitivity of electronic equipment to smoke gases (corrosion), high temperatures and sudden cooling (mechanical damage and thermal fatigue), it is recommended that extinguishants such as CO_2 and Halon 1211 (bromochlorodifluoromethane) or 1301 (bromotrifluoromethane) be used. One of the deficiencies of CO_2 is the sudden cooling of the gas jet as it is discharged from the extinguisher tank under high pressure, followed by sudden expansion, resulting in so-called thermal shock, intolerable sudden cooling of the equipment, frequently accompanied by disabling. Of the extinguishants mentioned above, Halon 1301 has the best characteristics. It is recommended for automatic fire-extinguishing systems in large establishments and in plants, institutes, and other such buildings. The trend in the development of such systems is highly promising in the field of automation of fire fighting.

1698. Anon

EXTINGUISHING INCIPIENT FIRES IN EXHAUST SYSTEMS

Cent Tech Bois. Bull Inf Tech; (75):21-22, 1976 (French)

A high-speed device that detects, checks and extinguishes fires in the exhaust systems of wood-processing and textile factories is described.

1699. Vasil'ev AD and Rubtsov YI

STUDY OF THE PROCESS OF WATER-SPRAY EXTINGUISHMENT OF CABLES

Elektr Stn; (2):72-73, 1976 (Russian)

In 1975-1976 experimental investigations were carried out by the Power Ministry of the USSR and the All-Union Fire-Protection Research Institute to determine the most rational automatic extinguishing systems for fires in cable enclosures using a water spray and to work out recommendations for their design. The efficiency of such systems was characterized by the specific total water discharge, defined as the quantity of water applied per unit area of surface to be protected or the product of the rate of delivery over the extinguishing period. It was found that it is necessary to determine not only the minimum critical spray intensity, but also a rational fire-extinguishing system that will provide a maximum effective water-spray coefficient. 2 figs.

1700. Anon

CUMBRIA DEMONSTRATES VALUE OF VEHICLE TYRE JACKET

Fire; 68(851):619, 1976

The demonstration of a fiberglass tire jacket manufactured by the Tuloz Safety Products Company (UK) for the purpose of extinguishing vehicle tire fires is reported. The dual rear tires of a vehicle were extinguished in 2 minutes by the driver of the vehicle (time required to apply the jacket) and in 15 minutes by the fire brigade (time required to respond). The suitability of using an asbestos jacket to extinguish tire fires is evaluated. It is pointed out that about 2,000 liters of water are needed to extinguish tire fires. 4 figs.

1701. Pring JL

SPRINKLER SYSTEM ENGINEERING

Fire Eng J; 36(103):21-31, 1976

The insurance and local authorities' roles in sprinkler system engineering, the fundamental reasons for rules, and some practical problems of integration with other services are explained in the article. It is intended to give the reader a greater understanding of the basis and intention of the rules and to assist in the practical problems of design and integration of this service into future buildings. Chart representations of parts of the 29th edition of the Fire Offices Committee Rules (UK) are included with some approximate formulations for some other technical considerations. 5 figs, 4 tables, 4 refs.

1702. Nash P

PORTABLE AND OTHER HAND-OPERATED FIRE-FIGHTING EQUIPMENT IN BUILDINGS

Fire Prev; (116):20-24, 1976

In this article the advantages and disadvantages of, and current design thinking on fire buckets, portable fire extinguishers, hose reels, medium-expansion air-foam generators, high-expansion air-foam generators, and mobile fire extinguishers are considered from the viewpoint of ease of use, range of applicability, and effectiveness against the types of fire for which it is intended. 1 fig, 4 photos. (Author)

1703. Nash P

THE ESSENTIALS OF FOAM EXTINGUISHING SYSTEMS

Fire Prev; (117):20-25, 1977

This article is the second in a series of three contributed by the author describing fire-extinguishing systems. The first one, "The Essentials of Sprinkler and Other Water-Spray Fire Protection Systems," appeared in *Fire Prevention*, No. 108. The third article will deal with dry-powder and gaseous extinguishing systems. Foams in general, the three classes of foam (low-, medium-, and high-expansion), and the typical systems associated with these three foam classes are described in the present installment. 14 figs. (Author)

1704. Mathijsen HT

TOTAL FLOODING SYSTEM FOR MACHINERY SPACE FIRE PROTECTION ON SHIPS

Fire Prot Rev; 39(428):318-319,321, 1976

Statistics indicate that every year the largest number of fires on ships occurs in machinery compartments. These fires, particularly those arising from oil spillage and lubricating and fuel-line failures, turn quickly into major fires. It is for this reason that an effective fire-fighting system must be installed. The answer is the use of Halon 1301 as an extinguishing agent. The Saval Co (The Netherlands) has developed and delivered a new Halon 1301 total flooding system for marine application based on its extensive experience in designing and engineering Halon fire-extinguishing systems over the years. A block diagram of the system is explained in detail in the text. 1 fig. (Author)

5. FIRE PROTECTION PRINCIPLES

h. Suppression Devices and Equipment—Continued

1705. Kozlyuk AI, Ivchenko AI, Korol AA and Mamaev VV
CALCULATION OF THE EFFECTIVE RANGE OF POWDER FIRE EXTINGUISHERS
Gornospasat delo; (13):17-20, 1976 (Russian)

The problem of determining the range of delivery of powder as a function of the physical and geometric parameters of the powder particles, the pressure in the container of the fire extinguisher, and the height of jet discharge is formulated and solved. The expression is in sufficiently accurate agreement with the experimental data and can be used to calculate powder fire extinguishers. (RZh)

1706. Ioshiba K
OPERATION OF FIRE-FIGHTING EQUIPMENT
Kuki tyowa to reito; 16(2):85-86, 1976 (Japanese)

Some problematical aspects of the use of fixed complex fire detection and extinguishing systems installed in factory and office buildings are analyzed. It is emphasized in particular that the operation of such systems is connected with the constant consumption of a certain amount of electrical power. This is especially true of systems containing ventilation subsystems (in the absence of a fire) and forced smoke removal subsystems in the case of fire. For various reasons the nominal installed power of such systems does not suit the interests of building owners. In such cases they order the development of economic fire safety systems tailored to their interests, but the efficiency and reliability parameters of such systems are, as a rule, lower than mass-produced fire-protection equipment. The trend toward custom design of fire-protection systems has increased since 1973 under the conditions of the incipient energy crisis. It is reported that for the purpose of resisting this trend in Japan changes in the fire-protection legislation are being prepared; according to these changes, the specifications governing the design and installation of fire-protection systems in public and office-factory buildings will be made considerably more rigorous. (RZh)

1707. Anon
TECHNICAL SPECIFICATIONS FOR FIRE-EXTINGUISHING SYSTEMS WITH HALOGEN COMPOUNDS
Ohm: denki zasshi; 63(3):182-191, 1976 (Japanese)

Technical specifications regulating a number of parameters of fire-extinguishing systems using halogen compounds as the principal extinguishant are presented. The optimal rates of expenditure of extinguishants per m^2 of fire area are given for the most widely used compounds of this type, Halon 1301, 1211 and 2402. These specific rates fluctuate from 0.32 to 5.4 kg/m^2, depending on the nature of the burning material. Also given is a description of the block diagram and operating principle of a fixed automatic fire-extinguishing system that uses Halon 2402 and is mass-produced by several companies in Japan. This system is completely self-contained and is recommended for use in factory buildings only a few floors in height. The specifications were developed by the Standardization Group of the Japanese Ministry of Construction and are recommended for adoption as national standards. 7 figs, 6 tables. (RZh)

1708. Stankiewicz Z
GAS GENERATOR FOR THE "GAG" FIRE EXTINGUISHER
Prz poz; 64(4):16-17, 1976 (Polish)

The design and operation of a gas generator for the "GAG" fire extinguisher are described. The Soviet GIG-4 inert gas generator was used as a prototype in its development. It is found that the gas mixture formed behind the aqueous diffusion cooler at a temperature of 340°K contains 30.2% N_2, 4.7% CO_2, 0.7% O_2 and 64.4% H_2O. The design of the generator makes it possible to transport it to the operational site in parts by any form of transportation and to reassemble it there in two hours. 6 figs. (RZh)

1709. Anon
LIGHT-WATER EXTINGUISHER
Schweiz Feuerwehr Z; 102(4):145-147, 1976 (German, French)

A mobile fire-extinguishing device put out by the 3M Co is described. This device is equipped with a 109-liter tank of "light water" concentrate, mounted on a 4-wheel carriage, a combined foam nozzle to produce a solid or spray jet at a pressure of 3.57 kg/cm^2, mixing and proportioning valves, and two hoses (120 m each) for supplying and delivering water. The device can be connected directly to a hydrant. The rustproof tank can be easily replaced, so that interruption of the delivery of extinguishant is minimal. The device is handled by one man. Since the concentrate is especially effective in extinguishing combustible liquids, the device is recommended for warehouse areas, paint and varnish factories, pumping stations, and chemical and petrochemical plants.

1710. Anon
DUST-FREE TESTING AND FILLING OF POWDER FIRE EXTINGUISHERS
Sicherheitsing; 7(5):38-39, 1976 (German)

An apparatus for filling powder fire extinguishers is now commercially available. With this apparatus extinguishers can be emptied or filled with a powder extinguishant without the formation of dust in the premises and in a comparatively short period of time. Not more than 1 min is needed to empty a container of a 6-kg charge of powder and not more than 2 min to fill it. Important features of the apparatus are its light weight and portability. It can also be used to recharge fire-fighting apparatus designed for extinguishing fires with dry powder.

1711. Bredow L
FIXED FIRE EXTINGUISHING SYSTEMS
Tech Mitt; 48(12):498-504, 1975 (German)

The steep rise in damages to be adjusted by fire insurers in the last few years has required the increased use of fixed fire-extinguishing systems for economic reasons alone. The cause of the increases in damages exceeding one million marks must certainly be associated with the transition from production of goods by skilled workers to industrial operations. The capital investment per square meter of production or storage area, owing to the use of special machines and high-rack storage, has increased strongly since World War II. The increase in fire damage is in direct proportion to this increase. If even one portion of the often strongly interacting production or storage divisions is out of action, the fire and plant-interruption insurance does cover the direct damage, but the loss of market and work positions is not protected by any insurance. Depending on the fire fuel and the fire load, a wide variety of extinguishing systems has been developed by the fire-extinguishing industry in the last few decades. These systems are roughly classified in this article by extinguishant. 6 figs. (Author)

1712. Rompa JG
FIGHTING FIRES WITH AUTOMATIC SPRINKLER INSTALLATIONS
Tijdschr watervoor en afvalwaterbehandel; 9(9):176-180, 1976 (Dutch; English Summary)

The structural design of various types of automatic sprinkler systems and their water supply problems are discussed. The Dutch regulations for sprinkler systems are presented. The quantities of water required for various kinds of buildings, classified in four hazard categories for this purpose, are calculated. Statistical data on fires extinguished by sprinkler systems in the period 1970-1971 are given. The advantages allowed by insurance companies to facilities equipped with sprinkler systems are mentioned.

1713. Kramer H
PROPORTIONERS AND PROPORTIONER FITTINGS — THEIR APPLICATION AND LIMITS
Unser Brandschutz; 26(11):26-28, 1976 (German)

From the results of measurements of the inlet and outlet pressures of model Z 1.5 and Z 4.5 jet suction proportioners (adjustable) and the pressures of the matching SSR 3/13 and 8/11 foam nozzles, respectively, for the purpose of determining the most favorable mutual orientation, it has been found that the "in-line method without subsequent increase in pressure" exhibits a number of disadvantages, eg, relatively low pressures at the foam nozzle, failure to reach great heights, and the necessity of setting up proportioning points close to the fire site. This situation is to be improved by suitable variations in attack, which will be discussed at a later date. 4 figs, 1 table. (Fachdok 13/0214)

1714. Emmrich F
FIREFIGHTING WITH CHEMICAL EXTINGUISHANTS IN PORTABLE AND MOBILE EXTINGUISHERS
VFDB Z; 25(4):121-123, 1976 (German)

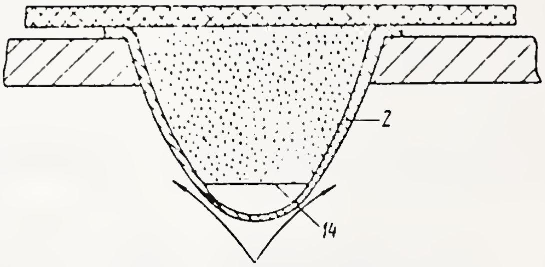
As an introductory remark it is emphasized that portable fire extinguishers are indispensable in fighting all kinds of incipient fires. In developing German industrial standard DIN 14,406 a particular effort was made to limit production to the extinguishants, extinguisher types and sizes that are actually needed. The range of portable or mobile extinguishers presently available on the market is examined critically, their suitability for use in fires of the different fire classes using appropriate extinguishants is discussed and related to the requirements of this standard, parts 1 and 2 of which are to be accepted as testing principles for testing and licensing. (This paper was presented at the public sessions of the Technical and Scientific Committee at the 1976 annual professional meeting of the VFDB in Berlin.) (Fachdok 13/0151)

1715. Strizhevskiy II and Zakaznov VF
EXTINGUISHING FLAMES IN FLAME ARRESTERS
Zh Vses Khim O-va; 21(4):433-440, 1976 (Russian)

The conditions of narrow-channel localization of the flame of ammonia-air mixtures and of vinylacetylene-air mixtures are considered. New designs of ribbon, compressed and metallo-ceramic flame arresters are described; they have been tested under field conditions with positive results and have been recommended for mass production. Methods of testing flame arresters are described; the development of a standard for flame arresters is recommended. 4 tables, 20 refs. (Author)

1716. Haupt E and Schleussner G
FIRE-PROTECTION DEVICE CONSISTING OF CEILING-MOUNTED POCKETS FILLED WITH DRY POWDER
FRG Patent No. 2,319,675; Cl A62C 35/10, Appl 18 Apr 1973, Discl. 27 Nov 1975, Assignee: Reichhold Chemie GmbH

A patent is disclosed for a fire-extinguishing device arranged on the ceiling of a premise (see the figure). The device consists of hollow bodies 2 made of a readily fusible material, but difficult to ignite. The pockets are divided into two zones by a foil 14. The lower, thinner portion is filled with air, the upper with a powder extinguishant. The angle at the point of intersection of tangents drawn to points of the lateral surface at the level of half the height of the body in the axial cross section is 60-120°. It is expedient to locate the device at a height of 2.3-3 m. The number of pockets is determined on the basis of 250-500g of dry powder (eg, sodium chloride with an ammonium phosphate additive) per m². The device is simple to manufacture, low in cost and does not require an outside energy source to actuate it. Different versions of the structural design of the device are illustrated. (RZh)



1717. Shinohara K and Naoi T
AUTOMATIC FIRE EXTINGUISHING SYSTEM FOR UNDERGROUND ELECTRICAL DISTRIBUTION LINES
Japanese Patent No. 50-25,759; Cl 95B262, (A62C 37/02), Appl 14 Jan 1970, Discl. 26 Aug 1975, Assignee: Nihon koei KK

A patent is disclosed for the design and operating principle of an automatic foam extinguishing system for the suppression of fires in the ducts of underground distribution lines for high-voltage cables. Upon actuation of a fire-detector, type not specified in the patent, the static balance of a system of mechanical levers and links is disturbed, leading to actuation of the self-contained foam fire extinguisher. The foam extinguishant is distributed through a system of pipes equipped with sprinkler heads. The distinguishing feature of the design is that actuation of the mechanical lever system also results in automatic interruption of the voltage in a section of the high-voltage distribution lines of up to 300 m in length, thus excluding the hazard of short-circuiting the wires when the foam extinguishant is applied to them. After the fire is suppressed, the electrical network is automatically restored. When the fire detector is actuated, the system transmits a low-current emergency signal to the control center. The circuit and operating principle of the alarm system are not considered in detail. 4 drawing figs. (RZh)

1718. Hattori T

SPRINKLER HEAD WITH AUTOMATICALLY VARIABLE SPRAY CONE ANGLE

Japanese Patent No. 50-32,558; Cl 95B260.3, (A62C 37/08), Appl 26 Jul 1966, Discl. 22 Oct 1975

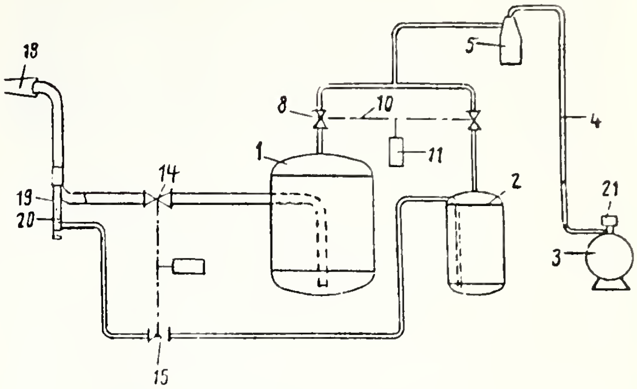
A patent is disclosed for the design and operating principle of a sprinkler head of a fixed building fire safety system. The particular feature of the design is automatic variation of the fire-extinguishing spray cone angle as a function of the pressure developed at the inlet of the head. The lower operating surface of the head is a spherical membrane with openings uniformly distributed along concentric circles. The inside of the head is provided with several spring-loaded metallic blades; the angle of radial deviation of these blades from the longitudinal axis depends on the pressure head of the jet of extinguishant. When the pressure increases (it being assumed that the system has been designed to permit variation of the operating pressure by varying the pumping power) the blades are deflected symmetrically to a greater angle so that the openings farthest from the center of the spherical membrane are actuated and the spray cone angle is maximum. This spray configuration makes it possible not only to increase the area of sprayed surface, but also to promote more uniform dispersion of water in the premise, thus preventing an increase in temperature as a result of a fire. 5 drawing figs, 1 ref. (RZh)

1719. Anon

FIRE FIGHTING INSTALLATION

Swiss Patent No. 570,174; Cl A62C 35/53, Appl 4 Jun 1973, Discl. 15 Dec 1975

The patent relates to a fire-extinguishing system that permits the use of either one fire-extinguishant or a mixture of more than one to extinguish fires. A container 1 (see the figure) contains the main extinguishant (eg, water) and container 2 contains the secondary agent (eg, foam compound). Container 3 is for compressed gas to force out the fluid in case of fire. When it is necessary to operate the system, valve 21 is opened and the compressed gas passes into containers 1 and 2 through pipe 4 and pressure regulator 5. If it is planned to use only water to extinguish the fire, the compressed air passes only into container 1 through valve 8. But if the nature of the fire requires the use of foam to extinguish it, the compressed air passes simultaneously into the water tank 1 and the foam-compound container by means of a special synchronizer 10, 11. Valves 14 and 15 are opened simultaneously, letting water and the foam compound into foam generator 18. A special regulator 19, 20 is provided for correct proportioning of the foam compound. 4 drawing figs. (RZh)

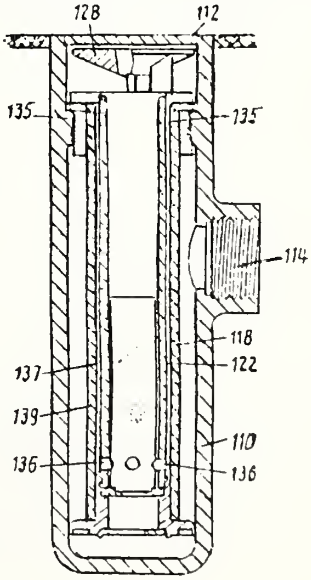


1720. Evans JL

FOAM-PRODUCING APPARATUS

UK Patent No. 1,412,499; Cl BIC, (B01F 3/04), Appl 23 Oct 1973, Discl. 5 Nov 1975, Assignee: Chubb Fire Security Ltd

The patent relates to a drencher designed to produce and distribute a mechanical foam over a burning surface; it is installed flush with the floor of the premise being protected. The foam solution is supplied to sleeve 114 (see the figure), then passes through the cavity between the outer (110) and inner (118) tubes of the drencher in the space between tubes 118 and 122 and raises them, tilting plate 112, which is located at floor level and closes the drencher when it is not operating. Then the foam solution passes into the inner cavity of tube 122 through a turbulence generator 137 and foam distributor 128. The air required to produce the foam is pumped from the atmosphere through opening 135 located in the raised tube 118, passes through gap 139 between tubes 118 and 122 and opening 136 in tube 122 into the chamber of the



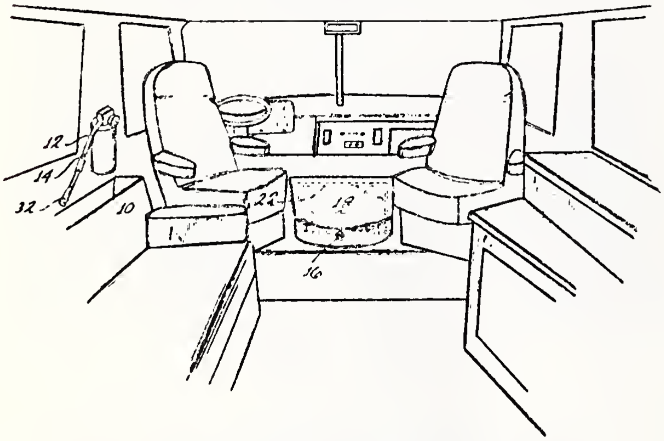
turbulence generator 137. The device described here is proposed for use in fire-extinguishing systems to equip premises where it is not expedient to install drencher assemblies above the floor because of the presence of various structures inhibiting upward distribution of the foam (eg, aircraft hangars). But it is emphasized that in such cases this kind of device can promote the distribution of foam in the fire area when a burning fuel spilling over the floor hits the drencher and is mixed with the foam being supplied. 2 drawing figs. (RZh)

1721. Nichols KB and Nichols JE

FIRE EXTINGUISHER SYSTEM FOR VEHICLE

US Patent No. 3,972,373; Cl 169/62, (A62C 35/12), Appl 25 Aug 1975, Discl. 3 Aug 1976

A standard fire extinguisher is modified by providing a quick-disconnect coupling interposed in its hose, so that its nozzle can be disconnected and the coupling can be connected to a mating quick-disconnect coupling exposed on a bonnet or the like covering a vehicle engine. The bonnet may be in the passenger compartment of the vehicle and opens to provide engine access. Tubing inside the bonnet and connecting to the coupling on the bonnet has discharge openings to distribute fire extinguishing fluid in fighting a fire in the engine compartment. 5 claims, 7 drawing figs. (Author)

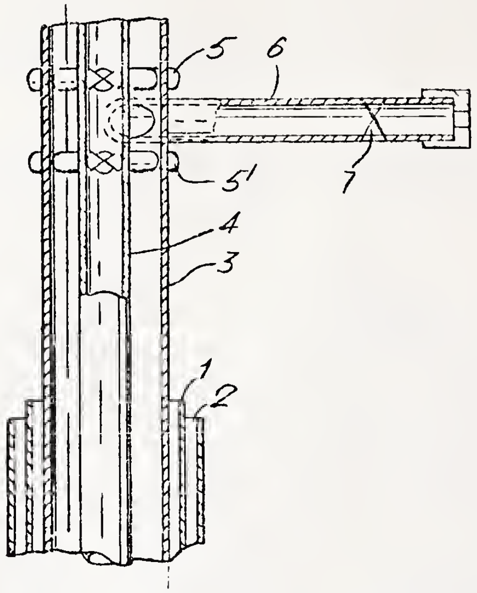


1722. Hefetz U

METHOD AND DEVICE FOR EXTINGUISHING FIRES IN OIL WELLS

US Patent No. 3,973,631; Cl 169/46, (E21B 22/00), Appl 31 Jan 1975, Discl. 10 Aug 1976, Priority: Israel, Appl No 44142, 5 Feb 1974

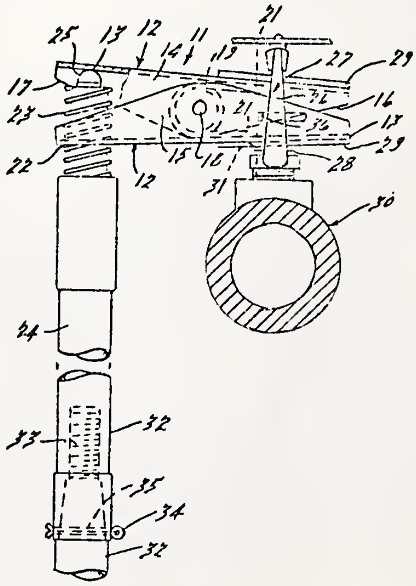
A method and apparatus for extinguishing oil-well fires in wells having an inner pipe and an outer pipe separated by an annular space are proposed. A plurality of rod-like members as drills are inserted in a common horizontal plane at equal radial spacing through the walls of both the inner and the outer pipes. The drills have interfitting inner ends which, when placed in side-by-side relationship, form a continuous wall equal to the internal cross section of the inner pipe. Accordingly, the inner pipe is closed against the passage of oil or gas therethrough. A valved pipe is inserted through the wall of the outer pipe below the drills to form a communicating passageway. A member is inserted through the valved pipe and into the annular space to gradually fill the space between the inner and outer pipes to form a seal therein against the passage of oil or gas therethrough. 12 claims, 8 drawing figs. (Author)



1723. Harrington CL

SPRINKLER HEAD SHUT-OFF MECHANISM

US Patent No. 3,976,141; Cl 169/90, (A62C 37/20), Appl 24 Jun 1975, Discl. 24 Aug 1976, Assignee: Wigma Corp, Royal Oak, MI



5. FIRE PROTECTION PRINCIPLES

h. Suppression Devices and Equipment—Continued

After the sprinkler heads alone or with other means have put out a fire, applicant's device is extremely useful for shutting off the flow of water from the heads to minimize the damage resulting from the continuous flow of water. The device is effective to shut off the water from the sprinkler heads whether or not the heads are mounted so that the opening is located at the top or bottom or with heads having openings at the top and also openings at the bottom. The device is so constructed as to seal off either type of opening when applied to a sprinkler head. 7 claims, 3 drawing figs. (Author)

1724. Bychikhin RL
DEVICE FOR SUPPLYING FOAM CONCENTRATE TO THE INTAKE PIPE OF A FIRE EXTINGUISHER
USSR Patent No. 448,868; Cl A62C 35/46, Appl 14 Feb 1972, Discl. 19 Dec 1975

A device for supplying foam concentrate to the intake pipe of a fire extinguisher is described. The device consists of a housing with a cover plate, a shut-off valve with an opening and closing mechanism and is distinctive in that the mechanism for opening and closing the shut-off valve is made in the form of a two-arm level fixed to the axis, one arm being connected kinematically to the shut-off valve, the other to a disk rigidly attached to the valve and located in the intake pipe of the extinguishers. 1 drawing fig. (RZh)

1725. Ivanov AF, Balagin PG and Litvinov VA
DEVICE FOR SPRAYING LIQUIDS
USSR Patent No. 476,034; Cl B05B 1/30, A62C 3/00, Appl 12 Mar 1973, Discl. 5 Nov 1975, Assignee: VNII protivopozhar oborony

A device for spraying liquids that can be used in fire protection is described. The device consists of a housing with chamber containing a piston, an ignition cylinder, a mounting flange, and a supply pipe. The device is distinctive in that a non-return valve is installed in the supply pipe and the nozzle is interchangeable so that the device can be actuated automatically. 1 drawing fig. (RZh)

1726. Miroshnikov AYa, Isaev MN, Zinov'ev EG and Molochnyy NM
FIRE EXTINGUISHING METHOD
USSR Patent No. 494,164; Cl A62D 1/00, A62C 1/10, Appl 4 Jul 1973, Discl. 1 Mar 1976, Assignee: VNII protivopozhar oborony

A description is given of a method of extinguishing fires by means of automatic and semiautomatic devices for the discharge of carbon dioxide onto the seat of a fire. The method is different in that the extinguishant is applied in the form of a stable aerosol so as to increase the extinguishing efficiency and reduce the expenditure of extinguishant. To do so, the entire pipeline up to the spray head is kept at a pressure above 4.2 bars (up to 15 bars). In order to prevent the carbon dioxide being discharged by the spray head from converting into a carbon dioxide snow, it is atomized into small droplets with a diameter of less than 200 microns. 1 drawing fig. (RZh)

1727. Richards RC
DEVELOPMENT OF EXPLOSION SUPPRESSION SYSTEM REQUIREMENTS FOR SHIPBOARD PUMP ROOMS. Coast Guard Res and Dev Center, Groton, CT; GR DC-2/76, USCG D-79-76, 91 pages, Jan 1976
Availability: NTIS AD-A031 308/0GA

The results of the explosion suppression test series conducted in the forward pump room of the tanker RHODE ISLAND (internal volume of 18,120 ft^3) are reported. Propane/air and n-Hexane/air mixtures near stoichiometric were used in 10 percent of the pump room volume. The n-Hexane was explosively dispersed and ignited by a propane flame. The unsuppressed tests produced maximum pressures of 12 psig. The suppression attempt was unsuccessful because the pressure detectors, set to trigger the suppression system at 1/2 psig, were too slow. The propane was injected through two 1/2-in. pipes and a delay time was provided between injection and ignition to permit the fuel to become quiescent. Upon ignition, the pressure developed very similarly to the n-Hexane explosions and more rapidly than expected. This was finally attributed to obstructions creating turbulence that increased the flame speed and thus the rate of pressure rise. Ultraviolet detectors detected the incipient explosion from 110 to 400+ milliseconds before a pressure detector set for 1/2 psig. Two explosion suppression systems were tested. They each were based on the following principles: 1) a UV detector sees the incipient explosion; 2) the control circuitry fires initiators; 3) the initiators rupture a diaphragm releasing a suppressing agent; 4) the agent is thrown at the flame front; and 5) the explosion is suppressed. In analyzing the tests, the size of the fireball at agent contact, agent breakdown, afterburning and the maximum pressure were considered. (Consult the Author Index for a related paper by this author.) (Author)

1728. Hill R and Boris PN
EVALUATION OF A HALON 1301 SYSTEM FOR POST-CRASH AIRCRAFT INTERNAL FIRE PROTECTION. Nat Aviat Facilities Experim Center, Atlantic City, NJ; FAA NA-76-21, FAA RD-76-132, 37 pages, Oct 1976
Availability: NTIS AD-A032 150/5GA

The use of a Halon 1301 fire-suppression system was evaluated in regard to increasing escape time during a ground crash situation with an internal cabin fire. Tests were conducted in a DC7 fuselage varying the exit configurations and fire size at agent discharge. Smoke, temperature, carbon monoxide, oxygen, and Halon 1301 levels were continuously monitored during the tests at various locations throughout the cabin. A sampling system for collecting hydrogen fluoride (HF), Halon 1301's primary decomposition product, was used. Samples at four locations were taken every 30 seconds for 5 minutes after discharge. The use of a curtain to inhibit the spread of

HF was also examined. The results indicated that in order to minimize the HF concentrations, the fire should be extinguished when its size is as small as possible and prior to the opening of cabin exits. In order to reduce HF concentrations, the cabin exits should be opened as soon as the fire is extinguished. The use of a curtain to partition the cabin greatly reduced the spread of HF from the fire zone to the protected section. Test results also indicated that a system malfunction causing Halon 1301 concentrations less than those needed to extinguish a fire could produce very high HF levels. Conversely, a deep-seated fire produced relatively small HF levels. (Author)

1729. Woolley WD and Rogers SP
PERFORMANCE OF ASBESTOS FIRE BLANKETS. Fire Res Sta, Borehamwood, UK; Fire Res Note 1057, 9 pages, 1 fig, 3 tables, 1 ref, Nov 1976

Fire tests involving liquid fuels (AVGAS and petroleum spirit), frying oil, wood and clothing have been carried out to evaluate the effectiveness of three different sizes of asbestos blankets. With the AVGAS and petroleum spirit the blankets were tested against fires of increasing size according to the CEN WG/70 Series. With frying oil the blankets were tested against burning oil, (1B, 2B, 3B, and 5B) with oil heated above the spontaneous-ignition temperature. Wooden cribs were used for assessing the performance of the blankets against cellulosic type fires and burning cloth used to simulate a clothing fire. The work has shown that the AVGAS tests provide a simple and effective means of assessing the "rating" of the blankets, but additional tests involving frying oil, wood and clothing are necessary to ensure that the blankets are suitable for general applications of this kind. The results should provide a useful means of assessing the performance of new types of blankets in comparison with the asbestos types. (Author)

1730. Pyle EW
NEW TECHNIQUE FOR WELDING AND EXTENDING SPRINKLER PIPES. Soc Fire Prot Engs, Boston, MA; SFPE TR-76-2, 9 pages, 1 fig, 3 photos, 1976
Availability: SFPE

A technique for isolating sections of an existing sprinkler system for alterations, repairs or extensions is proposed. Utilizing a wooden box fitted around a pipe and filled with liquid nitrogen, an ice plug is formed in the pipe that effectively stops the flow of water for the duration of the work. Tests indicate that in the event of fire following the formation of the ice plug, the ice plug can be quickly thawed, allowing the full flow of water. (Author)

6. FIRE SAFETY

a. AGRICULTURE AND WILDLANDS

[For more complete coverage of the wildland fire literature see ***Forest Fire Control Abstracts*** (Canada), and/or refer to ***Firebase***, the Interagency Fire Center of the US Dept of Agriculture (see forematter for address).]

b. COMMERCIAL OCCUPANCIES

1731. Ragot MR
AN EXAMPLE OF FIRE SAFETY IN A MODERN BUILDING
Rev Tech Feu; 17(153):15-17, 1976 (French)

A building in Paris with 8 underground and 5 above-ground floors was restored after a fire. The main portion of the building is used for the administration of various establishments. In addition, it houses two movie houses, a parking garage, and other facilities. The building is equipped with modern automatic fire detectors and extinguishers. Also provided is an automatic smoke-removal system. The stairwell is made smokeproof using drum smoke cutters. In order to facilitate delivery of water to the upper floors in case of fire, five dry standpipes of 65 mm diameter have been installed. A sequence of steps for systematic checking of all the safety systems and devices to keep them in constant readiness has been set up. For effective training of personnel in methods of extinguishing fires, a special center has been fitted out in one of the underground floors where a real fire in a metal container holding a combustible liquid and some wood is used for training. It has been found that people who, theoretically, know how to handle a fire extinguisher, forgot how to do so in the presence of flame and could not get the extinguisher to work. It is mentioned that this kind of building ought to have, in addition to the safety hardware, a specially trained team. 1 fig.

1732. Proessdorf T
FIRE PROTECTION IN COLD-STORAGE PLANTS
VFDB Z; 25(4):127-130, 1976 (German)

The many fires that have occurred in cold-storage plants during construction and operation are all attributable to the insulating materials (formerly bituminized cork, but now cemented polystyrene or polyurethane foams), as is clearly demonstrated by seven fires. The Property Insurers Association (Verband der Sachversicherer) intends to put out a guideline; the ideas and suggestions for fire prevention contained in draft form in this guideline are presented, to wit: since automatic fire alarm and extinguishing systems cannot be used in cold-storage plants for obvious reasons, incombustible insulating materials and interior components are recommended. Prescribed fire walls, fire compartmentation, protective fault-current circuits, FI protective switches, lights and other operating components of protective type IP 54, and an adequate water supply are mentioned as additional preventive measures. (This paper was presented at the public sessions of the Technical and Scientific Committee of the 1976 annual professional meeting of the VFDB in Berlin.) 7 figs. (Fachdok 13/0174)

c. ELECTRICAL

1733. St Onge GH

NATIONAL FIRE PROTECTION ASSOCIATION RECOMMENDED PRACTICE FOR ELECTRICAL EQUIPMENT MAINTENANCE NFPA 70B

Petroleum and Chemical Industry Conf, Annual, 22nd, Record of Conf Papers; 1975, Sep 15-17, Milwaukee, WI, pages 200-201

Sponsor: IEEE

The National Fire Protection Association (NFPA) Committee on Electrical Equipment Maintenance, established in 1968 as a result of recommendations from an ad-hoc committee, prepared NFPA 70B, "Recommended Practice for Electrical Equipment Maintenance." This practice, published in 1974 as a tentative recommended practice, has now been officially adopted by NFPA. This presentation provides information on the recommended practice and on the diversified interests represented on the Committee. It covers the scope and goals intended for the practice with emphasis on the recommended practice aspect, the four basic parts of the information presented in the practice, present status and future plans for the practice. Procedures and a timetable for submitting comments will also be covered. Copies of NFPA 70B will be available for purchase at the Petroleum and Chemical Industries Conference. (Author)

1734. Tommazolli F

ELECTRICAL INSTALLATIONS IN LOCATIONS WITH EXPLOSION OR FIRE HAZARD

Elettrotecn; 63(4):337-359, 1976 (Italian)

Discussed in this article along the lines of standardization of materials, in particular, the standard CEI 64-2(1973), is the general range of problems relating to installations in hazardous places. The physical phenomena which give rise to explosion and fire hazards are examined, as are the technical means available to prevent such hazards. Possible criteria, in particular, the criteria adopted in the CEI standards, are presented to arrive at a classification of the hazard situation. Protection methods used in safety design are analyzed in relation to finding ways to prevent ignition of explosive mixtures. The choice of types of safety devices suitable for reaching the desired safety conditions for various hazard situations is presented as a logical synthesis between hazard conditions, normal and abnormal operating conditions, and protection and installation methods typical for all types of safety devices. 3 figs, 5 tables, 20 refs. (Author)

1735. Copps-Zuccari G

CABLE GENERATING LITTLE SMOKE DURING FIRES

Gummi Asbest Kunstst; 29(4):208,210, 1976 (German)

The use of refractory materials based on chlorinated polymers such as polyvinyl chloride, chloroprene and fluorosulfoethylene for cable sheathings does not ensure reliable fire protection in power plants and oil wells. The studies showed that fire spread specifically over cables with PVC sheathings. Chlorinated polymers generate about 300 mg of HCl vapors per gram of combustible mixture during combustion, making it difficult to fight fires and destroying electrical equipment. In order to eliminate these phenomena, new materials were developed without halides and substances that emit toxic agents during combustion. Among these materials are mixtures of EPM ethylene-propylene rubber, XLPE polyethylene, butyl rubber, and also thermoplastic polyolefine. The results of an analysis of the air during the burning of cables with PVC sheathings and "Low-Smoke" silicone rubber are presented. A cable with Low Smoke sheathing does not contain HCl and has only traces of CO. 1 table, 2 refs. (RZh)

1736. Meese WJ and Beausoleil RW

EXPLORATORY STUDY OF GLOWING ELECTRICAL CONNECTIONS. Nat Bureau Standards, Build Serv Sec, Washington, DC; NBSIR 76-1011, 28 pages, Oct 1976

Availability: NTIS PB-259 641/9GA

The report describes and characterizes with quantifiable electrical and thermal measures the extent to which loose electrical connections in residential-type branch circuits have overheated in the laboratory. With loose electrical connections, which conceivably could be inadvertently duplicated in field installations, but with otherwise normal installation and operating conditions, visible glows have been observed under laboratory test conditions in nominal 120-volt, 15- and 20-ampere branch circuits with both copper and aluminum wire. Characteristics of the glow condition are differentiated from arcing-sparking as sometimes observed in making or breaking electric circuits. Glowing electrical connections may dissipate as much as 35 watts of power with a current of 15 amps in the circuit and as much as 5 watts with a current of 0.8 amp in the circuit. Temperatures over 750°F were measured on the break-off tab of receptacles. Metal outlet boxes housing glowing connections in an insulated wall test set-up representative of a common type of residential construction attained temperatures in excess of 450°F.

d. INDUSTRIAL OCCUPANCIES

1737. Veselov AI and Meshman LM

AUTOMATIC FIRE AND EXPLOSION PROTECTION OF FACILITIES IN THE CHEMICAL AND PETROCHEMICAL INDUSTRY [Avtomaticheskaya Pozharo- i Vzryvozashchita Predpriyatiy Khimicheskoy i Neftekhimicheskoy Promyshlennosti]

"Chemistry" Publishing House, Moscow, USSR; 280 pages, 1975 (Russian)

The principles of extinguishing fires and preventing explosions by automatic means are presented. A description is given of the most widely used automatic fire- and explosion-protection systems and assemblies and their component parts along with the specifications for the design, construction, calculation and operation of such systems and assemblies. The most typical examples of the use of automatic means for the protection of facilities of the chemical, petrochemical, and oil-processing industry are given. The book is intended for engineers and technicians of industrial plants, design organizations, fire protection and state municipal fire inspection agencies engaged in the design, development, installation and operation of automatic fire and explosion-protection means. It may also be of interest to instructors and students of technical educational institutions. 169 figs, 31 tables, 75 refs. (Author)

6. FIRE SAFETY

d. Industrial Occupancies—Continued

1738. Wikashima K and Ashobe M

FIRE PROTECTION SYSTEMS FOR CHEMICAL PLANTS

Denki gakkai zasshi; 95(11):1014-1020, 1975 (Japanese)

Manufacturing methods and operating features of complex automated fire-protection systems developed and used in various branches of industry are compared. It is found that the structure, operating principle and also the principal technical requirements for such systems are identical. A difference exists only in the operating principle of peripheral components such as fire detectors and in the design of sprinkler heads. Another difference relates to the type of fire extinguishants in use as a function of the specific features of the plant being protected. The third difference is of a purely quantitative nature, relating to the power of the effector units (nozzles, compressors, ventilators, etc). On the basis of an example of a fire-protection system developed in 1974 and introduced in a chemical complex in the Shizuoka Prefecture (Japan), some new types of mass-produced automatic fire-protection components, in particular fire detectors (two versions) responding to an ionized gas-air medium, are illustrated. Also given are descriptions of the structure, design and operating principle of a number of other modernized peripheral systems. 9 figs, 4 tables. (RZh)

1739. Anon

FIRE PROTECTION AND ACCIDENT PREVENTION IN SILOS

Dtsch Mueller Z; 74(6):91-92, 1976 (German)

The most frequent causes of dust explosions in silos have been sparks resulting from short circuits, slipping of conveyor belts, discharges of static electricity, and careless handling of fire. It is shown that the original ignition of a dust suspension by a spark or open flame causes large quantities of settled dust to billow up, leading to a secondary explosion and to severe material damage. The following measures are recommended to eliminate sparks: heavy sheathing for electric cables; lighting by searchlights through glass-covered holes in the roof; the speed of conveyor belts being monitored by sensors; and grounding to prevent discharges of static electricity. Open-flame work (welding, soldering) should be done according to instructions and all production should be stopped. Stairwells should be equipped with standpipes for one or two playpipes to extinguish a fire rapidly. Drencher systems are not required, since foam fire extinguishers should be available at hazardous spots. (RZh)

1740. Voropaev A

POLOTSKIY OIL REFINERY

Pozhar delo; (6):14, 1976 (Russian)

Measures designed to ensure the fire safety of the Polotskiy (USSR) oil refinery, presently under construction, are considered. Particular attention is devoted to equipping facilities with automatic fire alarm and extinguishing systems. A prospective plan for the introduction of automatic equipment with exact schedules for developing projects and installing fire-extinguishing systems was set up in collaboration with the refinery's administrative staff. The production areas and pumping facilities of the tank farms are equipped with fixed foam systems. Automatic fire-protection systems are installed in the storage areas. The premises of the information center with its computers are provided with gas fire-extinguishing systems. The production facilities, which are up to 40 m in height, the working platforms and sets of towers are equipped with dry standpipes, making it possible to connect fire hoses at every level. The refinery contains 54 dry standpipes. 1 fig. (RZh)

1741. Mazur S

FIRE-SAFETY PLANS IN INDUSTRY

Prz poz; 64(4):7-8, 1976 (Polish)

The organization of the fire-protection plan in plants of the Polish sewing industry is described. This is one of the forms of the self-help fire-protection system in which fire safety is provided by self-help teams set up in all departments of a plant and made up of a number of workmen headed by the department chief. The fire-safety plan is worked out by the heads of the self-help teams and the plant management in cooperation with fire inspection agencies and is subject to the approval of the ministry in charge of this branch of industry. Implementation of the fire-safety plan is supervised by members of the self-help teams and the fire inspection agencies. (RZh)

1742. Boettcher K-H

INCREASING FIRE SAFETY — IMPORTANT PREREQUISITE FOR UNINTERRUPTED PRODUCTION

Sicherh Bergbau, Energiewirt, Met; 22(2):43-44, 1976 (German)

The measures being taken in the "Rolling Mill" plant in Hedstedt in connection with the adoption of the new fire protection law in the GDR and the inauguration of modern manufacturing plants are reported. It is stated that it is necessary to install fixed carbon-dioxide and foam fire-extinguishing systems, to conduct operational and technical fire protection training, to maintain the equipment, public order and cleanliness, and also to ensure cooperation between plant management, fire safety inspectors of the fire protection agencies, and the entire work force. The fulfillment of these measures will create the prerequisites for operation without accidents and fires. (RZh)

1743. Karas V

SOME EXAMPLES FOR THE ADVANTAGEOUS FIRE-PROTECTION USE OF CERAMIC FIBERS IN INDUSTRY AND SHIP CONSTRUCTION

Sigurnost; 18(2):85-90, 1976 (Serbocroation)

The insulating properties and fire resistance of ceramic fibers can be used advantageously in various branches of industry. Several examples of their use are cited, among them, welding work in boiler and ship building, in the auto industry and in power plants. Ceramic fiber materials have also proved to be useful in insulating various electrical conductors and cables. 4 figs. (Fachdok 13/0213)

1744. Tiedke K

FIRE PROTECTION AND FIRE FIGHTING IN THE TEXTILE INDUSTRY

Text Prax Int; 31(3):242-244, 1976 (German; English and French Summaries)

The design features of fire-alarm systems and fire-extinguishing facilities in plants of the textile industry are examined. Particular attention is devoted to problems involved in using sprinkler fire-extinguishing systems with water- and air-filled pipelines and to the operation of CO_2 fire-extinguishing systems. (RZh)

1745. Mingenbach H
TASKS OF THE SAFETY SPECIALIST AS SEEN BY THE FIRE DEPARTMENT
Werkfeuerverband eV. Rundschreiben; (93/94):21-27, 1976 (German)

The occupational safety law and the accident prevention regulation require a safety specialist as the person responsible for implementation of the above-mentioned laws. The fire and explosion protection sector offers the safety specialists a broad field of action in questions of occupational safety. The details of the tasks of a safety specialist in the area of improving reliability and safety of a plant are discussed in the article. (Fachdok 13/0198)

1746. Abduragimov IM
CURRENT PROBLEMS IN INCREASING THE FIRE SAFETY OF INDUSTRIAL PREMISES
Zh Vses Khim O-va; 21(4):363-365, 1976 (Russian)

This is the lead article in an issue of the journal devoted primarily to problems involved in reaching maximum fire and explosion safety in plants of the chemical, petrochemical, and gas industry, as well as facilities engaged in extracting, storing, and processing oil and oil products, plants of the wood-processing industry, and others in which these problems are some of the most complex and urgent ones to be solved. The lead article is followed by ten articles devoted to this topic. (Consult the source index for these articles.)

1747. Vodyanik VI, Kovalev VK, Kozhushkov NP and Koval'chuk RM
SHUT-OFF VALVE
USSR Patent No. 499,439; Cl F16K 17/40, F16K 7/17, Appl 17 May 1974, Discl. 1 Mar 1976, Assignee: VNII tekhn bezop v khim prom-sti

A description is given of a shut-off valve for emergency protective systems in factories with fire and explosion hazards, localizing explosions, points of fire outbreak, and other interruptions of production processes in which rapid isolation of an apparatus from distribution lines is required. The shut-off valve has a gas control chamber containing a supply channel for working fluid that is shut off by an elastic membrane. The distinctive feature of the invention is that the control chamber is separated into two sections by the collapsible membrane. The portion above the membrane is provided with an explosive charge and is filled with pressurized gas which exceeds the pressure in the portion below the membrane. 2 drawing figs. (RZh)

e. INSTITUTIONAL OCCUPANCIES

1748. Smirnov VI (Ed) and Kozhevnikov AD
DIGEST OF INFORMATION ON FIRE PREVENTION
[Sbornik Materialov po Protivopozharnoy Profilaktike]
Rossel'khozizdat, Moscow; 255 pages, 1976 (Russian)

Collected in this digest are materials pertaining to fire-prevention standards and regulations as they apply to nurseries, schools, medical establishments, cultural and exhibition halls, as well as documents relating to the organization of fire-prevention duties in other premises of the national economy. The introduction of automatic devices is emphasized. The digest is intended for engineers (instructors) in the professional fire service, members of fire engineering committees in industrial enterprises and of voluntary fire brigades. (RZh)

1749. Perrin J
IS YOUR HOSPITAL READY FOR A FIRE?
Dimensions in Health Serv; 53(5):14-15, 1976

The functions of a fire committee in a hospital are outlined. Regular meetings should be held, an agenda should be followed, written minutes should be kept, action taken should be stated and fire practices should be planned. A fire plan should be developed to include the following: plans for the assignment of personnel to specific tasks and responsibilities; instructions relating to the use of alarm systems and signals; information concerning methods of fire containment and the location of fire-fighting equipment; systems for notification of appropriate persons; specification of evacuation routes and procedures; and other provisions as the local situation dictates. Various aspects of this plan are discussed. 4 figs.

1750. Myers LE and Rowe WE
FIRE AND SAFETY TRAINING FOR ROLE CHANGES
J Psychiatr Nurs; 14(8):17-23, 1976

A training program for the men employed in the Fire and Safety Department in a mental hospital to prepare them to meet the emergency needs of the patient population is described. The proposed program is also intended to encompass emergency staff needs. 33 refs.

1751. Farman JV
SAFETY OF THE SURGICAL PATIENT
R Soc Med Proc; 69(8):603-604, 1976

The hazards of fire are enormously increased in the case of hospital patients, most of whom are incapable of caring for themselves. This applies particularly to patients in operating theaters, recovery rooms, and intensive care units. Fire may cause direct damage, and this is what is thought of when considering fire risks. It is concluded that adequate escape routes and equipment must be provided and that all people working in these areas must have a clear idea in advance of the roles they must play. 2 figs.

f. MINING

[For more complete coverage of the mining literature see ***SMRE Safety in Mines Abstracts*** (UK).]

1752. Solodkin EI and Sokovnin VI
FIRE PROTECTION OF UNDERGROUND STORES OF FUELS AND LUBRICANTS
Gornyy Zh; (6):63-65, 1976 (Russian)

The existing fire protection in underground storehouses for fuels and lubricants, recommendations for increased protection and prevention of gas filling of mains are described and deficiencies are noted. 1 fig. (RZh)

1753. Staron T

DETERMINING A SAFE WIDTH FOR COAL PILLARS LEFT AT THE BOUNDARY WITH AN ACTIVE FIRE SECTION

Pr Cent Inst Ochr Pr; 26(88):3-49, 1975 (Polish; English, French, Russian Summaries)

A method has been proposed for determining the optimal safe fire width of a coal pillar at which only a safe quantity of carbon monoxide can penetrate active mine workings. In the first part of the article a relationship is derived to determine the width of the pillar taking into account the physico-chemical properties of the coal and the ventilation drop between the isolated fire area and the active workings. Considered in the second part is the compressive strength of the pillar (crushing) as a function of the depth of mine work, the preparation system, and the development of the seam, and its physico-chemical properties. A method of determining the optimal width of a column while simultaneously fulfilling the conditions of CO filtration under the effect of ventilation depression and the conditions of pillar stability under the effect of the mine pressure is examined in the third part. 47 refs. (RZh)

1754. Semeniy YaM and Shul'ga YuN

DETERMINING THE EXOGENOUS FIRE-HAZARD CATEGORY OF MINES

Ugol; (6):67-68, 1976 (Russian)

A method of classifying coal mines by fire hazard (not counting the self-ignition hazard of the coal) has been developed by the All-Union Mine-Rescue Research Institute (USSR). The fire-hazard factors are determined in the form of probability characteristics obtained by processing statistical data on underground fires. The product of the probability of a fire breaking out in a certain mine working and the probability of its development is taken as the fire-hazard factor. The probability of a fire breaking out characterizes the working in terms of the possibility of the appearance of hazardous thermal pulses; the probability of fire development depends on the presence of combustible materials and on the difficulty of extinguishing them. In determining the fire hazard of mines as a whole, a mine is considered as a complex system with fire hazard dependent on the total fire hazard of its workings. These factors are determined by special tables, which specify the possibility of determining the "expected" number of fires and relegate the mine to one of five fire-hazard categories. By comparing the theoretical and actual number of fires, it is possible to estimate the fire-prevention status and the level of technological discipline. A verification has shown that about 6% of active mines belong to mines with the greatest potential fire hazard (categories IV and V). At the same time, in a number of organizations, all the mines belong to categories I and II, that is, with low hazards. Therefore, the majority of exogenous fires are due to the low level of technological discipline and to inadequate supervision of fire prevention measures. 1 table. (RZh)

1755. Kaczko W, Latala H, Polak T and Szafer M

NEW METHODS OF PREVENTING AND EXTINGUISHING FIRES IN WASTE HEAPS

Wiad Gorn; 27(3):83-87, 1976 (Polish)

A report is made on the successful use of an 8.5 ton VT-8 vibration roller made in Czechoslovakia to prevent spontaneous ignition and to eliminate spontaneous ignition and combustion centers in coal waste heaps. After rolling over the waste three times, the surface of the heap is lowered by 8-10 cm and the smoke generated by the heap is reduced appreciably. It is emphasized that to prevent self-ignition of waste heaps, the waste mass should be dumped in layers over the entire area of the planned heap and the individual layers should be appropriately packed and tamped. Experience in suppressing the burning of a waste heap of the Wawel mine using a vibration roller is cited. 3 figs, 3 refs. (RZh)

g. POWER PLANTS

1756. Inst Reaktorsicherheit

DESCRIPTION OF THE PRESENT PRACTICE CONCERNING SAFETY CRITERIA FOR NUCLEAR POWER PLANTS

Institut fuer Reaktorsicherheit, Koeln, FRG; 40 pages, 1976 (German)

Discussed in this monograph are the provisions of Safety Criteria 2.7: Fire and Explosion Protection, Subsection: Protection of Nuclear Power Plants Against Fires of Internal Origin, which were developed by the Institute for Reactor Safety of the Technical Supervisory Associations Inc, Cologne, FRG. Ways and means of achieving the objects of these criteria are advanced and proposals are made for improvement.

1757. Chappellier A

FIRE PROTECTION IN NUCLEAR CENTERS

Ann Mines; 182(2):109-116, 1976 (French; English, German, Russian, Spanish Summaries)

The specific problems of fire safety of atomic power plants are described. The potential cause of outbreak and spread of fire are analyzed. A large fire that occurred in March 1975 at an atomic power plant in Alabama, USA, is described. It took more than 7 hours to extinguish the fire, which caused considerable damage. The basic principles for the development of standards and regulations to ensure the fire safety of atomic power plants are proposed.

1758. Fruchard M

SAFETY TESTS ON SODIUM FIRES AT CADARACHE

Bull Inf Sci Tech; (210):47-53, 1976 (French; English Summary)

Safety tests on sodium fires carried out at the Cadarache Nuclear Center (France) by the Department of Nuclear Safety, Radioactivity Transfer Safety Experimental Section, have two principal objectives, namely, 1) analysis of the behavior and thermodynamic consequences of accidental fires, working on the basis of typical experimental results, and 2) research and development of methods and equipment to control and, eventually, to extinguish these fires. The most important part of this program concerns the sodium pool fires that would result from failure of a secondary circuit pipe. 5 figs, 2 tables, 4 refs. (Author)

6. FIRE SAFETY

g. Power Plants—Continued

1759. Huber F, Menzenhauer P and Peppler W
INVESTIGATION OF SODIUM AREA CONFLAGRATIONS AND TESTING OF A PROTECTIVE SYSTEM
Nucl Eng Des; 35(1):155-162, 1975

During research and development work on the SNR-300 sodium-cooled fast reactor, the consequences and confinement of sodium fires occurring in enclosures were studied. The behavior of liquid sodium during fires and the behavior of an inherently ready-for-operation protective system are described. Theoretical considerations on the behavior of burning liquid sodium are compared with experimental results. A protective system for large facilities is presented and the use of extinguishing powders is reviewed. 7 figs, 1 table, 8 refs. (Author)

1760. Coon W
FIRE PROTECTION FOR STEAM POWER GENERATING PLANTS
Power Eng; 80(6):68-71, 1976

The major hazards found in a fossil fuel power generating plant are unprotected floor openings, unenclosed fire-hazard areas, flammable liquid storage and use, coal storage and handling, transformers and cooling towers. But various design and equipment needs can add to the list. This would include, eg, dust collectors, boiler feed pumps, hydrogen storage, pulverizers, cable runs, control consoles, general storage areas, and gas-turbine generators. Protection requirements for various hazards are discussed under the individual headings. In general, a total concept approach to solve the problems is recommended, best done at the design stage by a full design team including a fire protection engineer. 1 fig, 2 photos. (Author)

1761. Anon
FIRE PROTECTION GUIDELINES FOR NUCLEAR POWER PLANTS. Nucl Reg Comm, Office of Standards Dev, Washington, DC; REG/G 1.120(6-76), 23 pages, Jun 1976

Guidelines acceptable to the NRC staff for implementing in the development of a fire protection program for nuclear power plants are presented. The purpose of the fire protection program is to ensure the capability to shut down the reactor and maintain it in a safe shutdown condition and to minimize radioactive releases to the environment in the event of a fire. If designs or methods different from the guidelines presented herein are used, they must provide fire protection comparable to that recommended in the guidelines. Suitable bases and justification should be provided for alternative approaches to establish acceptable implementation of General Design Criterion 3. (Author)

h. PUBLIC BUILDINGS

i. RESIDENTIAL OCCUPANCIES

1762. Jurgen RK
WHERE THERE'S SMOKE
IEEE Spectrum; 13(8):24-26, 1976

In order to assist the homeowners concerned about safeguarding lives in making a selection from a number of relatively inexpensive smoke detectors now on the market, the operating concepts of these devices, their optimal installation sites, the characteristics of fires, and a family escape plan are described. 3 figs, 6 refs.

j. TRANSPORTATION (Air, Rail, Road, Water)

1763. Krokhmal DYu
ENSURING THE FIRE SAFETY AND CORROSION RESISTANCE OF CARGO HOLDS OF TANKERS WHEN FILLED WITH COMBUSTION PRODUCTS
Sb nauch tr Leningr vyssh inzh mor uch-shche; (15):49-53, 1976 (Russian)

The problem of ensuring the fire safety and corrosion resistance of cargo holds of tankers is considered. A criterion permitting determination of the possibility of using auxiliary boilers to fill the cargo holds of tankers with smoke gases is proposed. A classification of inert-gas systems is advanced. 2 figs, 9 refs. (RZh)

1764. Hill RG
FLIGHT TEST OF A SELF-GENERATING OVERHEAT DETECTION SYSTEM. Nat Aviat Facilities Experim Center, Atlantic City, NJ; FAA NA-75-58, AFAPL TR-76-1, 21 pages, Jan 1976
Availability: NTIS AD-A031 591/1GA

Flight tests were conducted on two self-generating overheat detection systems installed in the number two nacelle of a Federal Aviation Administration (FAA) Convair CV880. The systems were mounted inboard and outboard in the nacelle paralleling the existing aircraft system. The outboard system logged 722.2 flight hours with no problems reported. The inboard system logged 615.0 flight hours. Shortly after the inboard system was installed, overheat warnings were obtained when the thrust reversers were used. The problem was found in the control box that caused the system to alarm at a lower temperature than was set. The inboard system then operated flawlessly for 585.9 flight hours until another problem in the control box caused the system to cease operating completely. No false alarms were noted, at any time, from electrical noise. It is concluded that the self-generating system tested is an air-worthy system that should decrease the false fire warning rate in engine nacelles. (Author)

1765. Perry JL and Wittman GR
THERMAL PROTECTIVE COATINGS. Aeronutronic Ford Corp, Aeronutronic Div; U-6213, 68 pages, Mar 1976
Availability: NTIS AD-A031 035/9GA

An exploratory research and development program was performed for the purpose of providing an effective thermal barrier for aircraft and pilot protection in the event of an aircraft fire. The primary objective of the program was Task I, which consisted of examining the effectiveness of expanding naturally occurring fillers (perlite and vermiculite) when used in combination with organic and inorganic matrix coating systems. Both filler systems expand and increase in volume up to 20 times when exposed to heat and liberate no toxic gases. Thin coatings of these filler systems combined with various organic intumescent paints and inorganic matrix systems were developed and thermally evaluated. Test specimens were exposed to a frontface thermal flux environment of 13.5 Btu/ft^2 sec

6. FIRE SAFETY

j. Transportation (Air, Rail, Road, Water)—Continued

(15.3 joules/cm² sec) within the door opening of an electric furnace while the aluminum substrate specimen backface temperature rise with respect to time of exposure was continuously monitored and autographically recorded. The most effective thermal coating developed was composed of an intumescent paint, No. 3 grade Vermiculite and 0.5 in. (1.27 cm) length graphite fiber in the respective ratios of 65.8, 33.9, and 0.03% by weight. This coating, when applied at a thickness of 0.060 in. (0.15 cm) to an aluminum substrate and tested as described, will insulate the substrate for a period of 6.8 minutes before a temperature of 500°F (260°C) is reached and for a period of 17.4 minutes before a temperature of 800°F (427°C) is reached. Task II consisted of thermally characterizing 60 government-furnished ceramic felts by exposing them to a thermal flux of 15 Btu/ft² sec. (Author)

7. FIRE SERVICE ORGANIZATION AND FACILITIES

a. ADMINISTRATION, ORGANIZATION AND MANAGEMENT

1766. Caulfield HJ
ARE YOU REALLY IN CONTROL?
Fire Command; 43(12):25-27, 1976

The psychological relationship between the commander and the commanded is discussed in terms of the "zone of indifference," a concept that explains the limits within which most individuals willingly obey orders that to a disinterested observer may appear unreasonable.

1767. Isman WE
UNDERSTANDING GRADING SCHEDULE CAN MAKE ISO SURVEY ROUTINE
Fire Eng; 129(11):70,73, 1976

To assist fire service management personnel in preparing for an Insurance Services Office (ISO) grading visit, the author discusses the way a grading is conducted, how to plan for it, and gives a summary of the major points of the grading schedule. Three tables present class rating by deficiency points, relative values and maximum deficiency points, and a deficiency scale. 3 tables, 2 refs.

1768. Filer DF
WHAT'S YOUR MANAGEMENT STYLE? (a) BY CHANCE, (b) BY CRISIS, (c) BY OBJECTIVE
Fire Command; 43(10):18-19,30-31, 1976

Management-by-Objectives (MBO), rather than by crisis or chance, is proposed as a method of making a fire department more productive and more efficient without prodding from legislative overseers. Preparation of a set of objectives and measurement of objective achievement are outlined step by step on the basis of the experience of the Tempe, Arizona, experience. 1 fig.

1769. Waters JM
DO YOU REALLY NEED THAT AERIAL LADDER TRUCK?
Fire Command; 43(11):22-24, 1976

The Insurance Services Office (ISO) recommendation of a ratio of one ladder to every three engine companies, and a ratio of one-to-two in the high-value, highrise districts, is contested. The alternative of Quick Response Squads (QRSs) with custom-equipped surplus pumpers tailored to the particular needs of the city was adopted in Jacksonville, Florida. The concept, modified equipment, functions and effectiveness of these squads are discussed. 3 photos.

b. EDUCATION AND TRAINING

1770. Anon
FIRE SERVICE ORIENTATION AND INDOCTRINATION
IFSTA, Fire Prot Publications, Oklahoma State Univ, Stillwater, OK; 1st edit, 137 pages, 1976

Written for paid and volunteer recruit firefighters, this newest IFSTA manual reviews the history of the fire service from the days of the Roman Empire and then describes the operations of the various types of fire companies – from engine to fireboat companies. The recruit reader will also learn about the administrative functions of a fire department and, through job descriptions, the duties of the various ranks. In addition, there is a 40-page section defining words and phrases that are unique to the fire service. It is a manual that gives the recruit an insight into what the fire service is all about and how training and education can increase a member's usefulness to a fire department.

1771. Gray R
RETENTION IN BASIC FIRE TRAINING
Fire Chief; 20(12):28-29, 1976

Retaining knowledge learned at drills is aided by following three principles: 1) dividing the training problem into logical segments; 2) remembering that the retentive powers of each man are different; and 3) stressing individual attention when necessary. 4 photos. (Author)

1772. Doran J
COMBINED TRAINING PROGRAM MEETS CHANGING NEEDS
Fire Command; 43(10):24-25, 1976

Firefighter training for all paid and volunteer personnel at the Baltimore County Fire Academy in Maryland is outlined. The fire fighting, rescue and fireground hydraulics training sessions are discussed. Annual one-day seminars are held. Seminar expansion plans are included. 3 photos.

1773. Makarenko V
OBSTACLE COURSE FOR PSYCHOLOGICAL TRAINING
Pozhar delo; (7):24-25, 1976 (Russian)

A "psychological training course" being used in the Severodonetsk (USSR) fire brigade to accustom firemen to the psychological conditions of real fire is described. Trainees overcome such obstacles as a fire wall, a ditch filled with highly combustible burning liquid, etc. 1 fig.

1774. Holliday B
RADIOLOGICAL PROTECTION AND THE FIRE SERVICE
Radiol Prot Bull; (14):16-17, 1976

7. FIRE SERVICE ORGANIZATION AND FACILITIES

b. Education and Training—Continued

It is generally assumed in the Home Office (UK) publication "Fire Fighting Hazards of Radioactive Materials," *Technical Bulletin*, No. 4, 1958, that on premises where the sources are substantial there will be staff available who are qualified to point out what the dangers are and the steps that need to be taken. In these circumstances the fireman has been instructed to maintain a low profile regarding radiological protection. The basic training given to the Fire Service on the hazards associated with ionizing radiation, their detection, and the protective measures necessary to reduce the risk, is intended to meet the fireman's needs in coping with emergencies where radiological protection has to be considered. (Author)

c. FACILITIES

1775. Brown JR, Crossen JG, Davis JN, Grant RJ and Malinovsky RA
AN ENGINEERING DESIGN OF THE CONSOLIDATED FIRE STATION, WRIGHT-PATTERSON AFB, OHIO. VOL 1. EXECUTIVE SUMMARY. Air Force Inst Tech, School of Eng; GCE MC/76S-2-Vol 1, 28 pages, Sep 1976
Availability: NTIS AD-A030 398/2GA

An engineering design study was conducted on a proposed consolidated fire station for Wright-Patterson Air Force Base. The goal of the study was to design a specific plan after examining alternate methods of construction and different building materials. Six functional floor plans were considered in the design. The floor plan selected was analyzed using six different structural schemes. A single-story design with a drive-through capability was selected using a combined steel frame with load-bearing concrete masonry walls. A variable-volume air-conditioning system was selected for installation in the station on the basis of economy. A perimeter circulating hot-water heating system was designed. Hot water will be generated for the heating system by a heat exchanger using steam from a base central heating plant. Solar energy was considered as an energy source but was found to be uneconomical. A complete electrical design was accomplished using 208/120 volt power supplied through a 150 KVA transformer. An emergency electrical system was incorporated into the electrical design which will use a 30 KW Diesel generator with an automatic start and load-transfer capability. The design provides for a fire-detection system and an intercom system within the station. See also Vol 2, GCE MC/76S-2-Vol 2, AD A030 355. (Author)

d. GENERAL EQUIPMENT

1776. Hoelzl G
HIGH- AND MEDIUM-PRESSURE PUMPS WITH THE HIGH-PRESSURE PORTION IN FIRE APPARATUS. ANALYSIS OF THE LITERATURE WITH A COMPILATION OF PREVIOUS RESEARCH RESULTS; COMPARISON WITH MEDIUM-PRESSURE PUMPS USED IN GERMAN FIRE DEPARTMENTS
Duisburg, FRG; 1975 (German)

This paper, which was submitted as part of the fire assessor's examination, is aimed at determining the extent to which high-pressure rotary pumps meet the requirements for fire-service equipment and whether the operational usefulness would make it worthwhile to promote their introduction or whether the medium-pressure rotary pumps now being used are still up to date. After studying and comparing the advantages and disadvantages of high- and medium-pressure rotary pumps, it was found that the medium-pressure pumps are superior, on the one hand, because they are simpler to handle and service and, on the other hand, because their water output is good and because they can be rapidly changed over to foam application. 4 tables, 41 refs. (Fachdok 13/0169)

1777. Loeb DL
LARGE DIAMETER HOSE
Fire Chief; 20(10):44-47, 1976

Friction loss, flow factors, and the overall benefits derived from using fire hose larger than 2-1/2 in. size are discussed in part 2 of this 5-part review (see *FTA* 1(3), abstract 969, for part 1). The author continues with the range of 3- and 3-1/2-in. hoses, leaving larger sizes (up to 6 inches) for future installments. 4 photos, 2 tables. (Author)

1778. Loeb DC
LARGE DIAMETER HOSE
Fire Chief; 20(12):30-33, 1976

Discussed in this fourth of five installments on large-diameter hose are the operational procedures that have been developed by large and small fire departments. 3 photos. (Author)

1779. Morris JA and Pfeiffer ED
COLD PROTECTION FOR APPARATUS
Fire Eng; 129(10):32-33, 1976

Recurring problems of fire response delays due to hard cold engines and air-brake pressure buildup requirements can be averted with plug-in support systems; air pressure and electric heating systems for engine water can maintain fire apparatus in a state of instant readiness. 4 photos.

1780. Milcke G
INTERCHANGEABLE TRUCK BEDS OF THE BERLIN FIRE DEPARTMENT
Brandschutz; 30(11):288-289, 1976 (German)

The first group of interchangeable (containerized) truck beds consists of ready-made 20-foot plywood modules suitably equipped as a repair shop, a workshop for breathing protection, a radiation-protection workshop, and a diving-team module. The second group consists of equipment containers less than 6 feet in height mounted on multilift frames. The equipment compartments are formed by revolving shutters. One set contains equipment to handle oil spills. Multilift frames were used as a platform for another group. The cargo, for instance, scaffolding or snap-coupling pipes, is contained by side stanchions and is covered with tarps. Another group consists of containers for liquids mounted on multilift frames, eg, foam containers. The last group consists of open containers and platforms, such as hoppers, a dump-truck bed, or a forklift lashed to a platform. 9 figs. (Fachdok 13/0143)

1781. Anon
1977 FIRE SERVICE CATALOG
Fire Eng; 130(1):71-123, 1977

7. FIRE SERVICE ORGANIZATION AND FACILITIES

d. General Equipment—Continued

This issue of *Fire Engineering* contains the 1977 fire service catalog, which lists the gamut of fire- and emergency-service equipment, general and personal, and ancillary parts and fittings. The classified equipment index is on p. 71, followed by 42 pages of listings, alphabetically under the manufacturers.

1782. Kurov VI, Lukin VA, Semenkin OA, Selin EG and Goryachev NV
ELECTRICAL EQUIPMENT OF A TURNTABLE LADDER
USSR Patent No. 488,904; Cl E06C 5/00, Appl 4 Jun 1974, Discl. 7 Jan 1976, Assignee: Osob konstrukt byuro protivopozhar tekhn

A description is given of the electrical equipment of a turntable ladder consisting of a threshold device between the top of the ladder and the operator, electrical checking of ladder motion using sensors, lock mechanisms with electrical signalling of operation, headlight, spotlight and communications cable. The distinctive feature of the equipment is that in order to guarantee connection of the electrical wiring to each section of the ladder and to simplify maintenance, the connecting cable is made in the form of individual cable sections provided with plug and socket units joined successively by means of terminal boxes, which are installed in each section of the ladder. The cable sections are tensed by means of spring-loaded units and are located between the lateral framework of the ladder. (RZh)

e. INFORMATION SYSTEMS

1783. Herterich O
FIRE PROTECTION — DOCUMENTATION AND INFORMATION. PROBLEMS — STATUS — GOALS
Fire Protection Seminar, Internat, 5th, Papers, Vol 2; 1976, Sep 22-24, Karlsruhe, FRG, pages 223-235 (German)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

The problems involved in documentation and information, especially in the field of fire protection, are identified. The result of an inquiry made of existing documentation centers has shown that various classification principles are being used, making it difficult to cooperate and impossible to compare data. A desire has been expressed for greater uniformity and exchangeability of data; this would be possible using a "Fire Thesaurus" as a uniform classification principle for all documentation centers. The ideal goal would be the formation of centers, which would cooperate on a regional basis with the already existing facilities and would transmit their collected data to a central data bank, where they could be retrieved at any time and thus be made available to all interested parties. 2 figs, 7 refs. (Author)

1784. Rock BW
THE NATIONAL FIRE DATA CENTER OF THE NATIONAL FIRE PREVENTION AND CONTROL ADMINISTRATION
Fire Protection Seminar, Internat, 5th, Papers, Vol 2; 1976, Sep 22-24, Karlsruhe, FRG, pages 237-254
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

This paper discusses the legislative mandate of the National Fire Prevention and Control Administration (NFPCA), the program elements of the NFPCA and the programs of the National Fire Data Center that support the objectives of the NFPCA. The National Fire Data Center has developed a fire incident reporting system, which will permit determination of fire causal events. The Data Center has also developed a non-quantitative data collection and dissemination system, the National Fire Reference Service. The data bases of these two systems, when combined and analyzed, will furnish information on the United States' fire problem that can be used to determine problem areas and suggest solutions to the problems and permit measurement of fire program effectiveness. The Data Center has also initiated liaison with other countries to obtain information on their fire experience. This effort is expected to permit application of successful foreign programs to the United States' fire problem, where applicable. The total of the Data Center effort will provide an accurate analysis of the fire problem, identify problem areas, assist in setting priorities, determine possible solutions to problems, and monitor the progress of programs to reduce fire losses so that users can initiate, support or redefine programs. 2 figs, 5 refs. (Author)

1785. Kerr JW
DATA AND DECISIONS
Fire Protection Seminar, Internat, 5th, Papers, Vol 2; 1976, Sep 22-24, Karlsruhe, FRG, pages 255-262
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

Availability of fire-related data to users, including fire prevention, fire suppression, and research leaders, is discussed in terms of credibility, completeness, timeliness, and overall reliability. Effects of inaccuracies and inadequacies are evaluated as to degradation of operational system performances and training material content, and as to potentially deleterious influence on research and library development. Wide variations in quantity and quality of data are found in various subdivisions of the area. Suggestions are proposed for improving collection, storage, retrieval and dissemination, and use as aids in research decisions. 1 fig, 4 refs. (Author)

f. INVESTIGATION AND REPORTING

1786. Karlsch D and Hartmann H
ATTEMPT AT SYSTEMATIC COVERAGE OF MAJOR FIRES
VFDB Z; 25(4):114-118, 1976 (German)

Now that about 200 fires have been covered and analyzed, the first results are available from which conclusions can be drawn as a guideline for further development of efforts in this area. The method of covering the fires, which consists in evaluating the daily press, making contact and discussing with the fire department that handled a reported fire, talking to the local editors, inspecting the fire scene, and entering all the information that has been gathered in report forms, is discussed. These items of information, together with photographic material, form a source for further insight in the various areas of fire protection. (This paper was presented at the public sessions of the Technical and Scientific Committee of the 1976 Annual Professional Meeting of the VFDB in Berlin.) 9 figs. (Fachdok 13/0127)

7. FIRE SERVICE ORGANIZATION AND FACILITIES

f. Investigation and Reporting—Continued

1787. Edwards DE
PROBLEMS INVOLVED IN IMPROVING THE COLLECTION OF FIRE INCIDENT STATISTICS FROM BRIGADES
Fire Protection Seminar, Internat, 5th, Papers, Vol 3; 1976, Sep 22-24, Karlsruhe, FRG, pages 51-58
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

The design of a fire report form requires a compromise between, first, the desire for as much data as possible; second, the need to minimize the work of the fireman completing it, in terms both of research at the fireground and of effort in filling it in; and third, the need for ease of data handling. A form has been devised which, it is felt, reaches some form of acceptable compromise, including, with a minimum of demand on the Brigades, as much data as can reasonably be collected routinely about every fire they attend, with the exception of the financial loss due to the fire. This form is undergoing a pilot study, and another study is investigating a possible method of obtaining direct financial losses. (Author)

g. PERSONAL EQUIPMENT

1788. Hendrick D
THE USE AND CARE OF SELF-CONTAINED BREATHING EQUIPMENT
Training Systems Internat, Houston, TX; 107 pages, 1976

Although the donning of three makes of breathing apparatus is described in this plastic-ring-bound booklet, the most informative material for the firefighter is the information on how to clean and inspect this equipment. An inspection record chart is included in this section of the booklet.

1789. Walther H-J
TESTING THE TEMPERATURE AND THERMAL STABILITY OF BREATHING MASKS
Draegerheft; (304):13-17, 1976 (German)

To test the resistance of protective breathing masks to the effects of short-term application of flames, they are exposed to flame for 5 sec on a test apparatus following a check for leaks. After being exposed to flame, the mask, coupling, and exhalation valve must not continue to burn, and the mask must still be airtight when tested after exposure. The masks are also subjected to long-term tests: 1) they are exposed to a dry atmosphere for 72 hours; 2) they are stored for 72 hours in an atmosphere of 70°C and 100% relative humidity; and 3) they are kept at a temperature of -30°C for 24 hours. After the long-term tests the masks must still be sufficiently elastic; they must meet the requirements of the airtight test, as well as the requirements of mask fit and adequate stiffness of the mask material. These specifications are met by the Draeger Panorama-Nova masks. 5 figs, 2 refs. (Author)

1790. McLaughlan PB, Anuskiewicz T and Keune FA
THE NASA FIRE-FIGHTER'S BREATHING SYSTEM
Fire; 69(860):449-452, 459-460, 1977

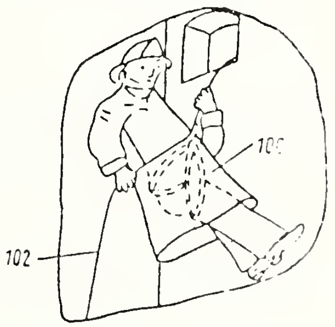
The National Aeronautics and Space Administration (NASA), as a part of its technology utilization program, has developed an improved Fire-Fighter's Breathing System (FBS) at the request of the nation's fire service. This paper's objective is to describe the technology application process as successfully applied to the FBS program. The technical objectives and design concepts are discussed and emphasis is placed on the involvement of the users, manufacturers and federal agencies to overcome the technology transfer barriers. Field evaluation tests are presented and a program plan for similar technology transfer programs is recommended. (This paper was presented in 1976 at a conference held by the Aerospace Division of the American Society of Mechanical Engineers.) 4 figs, 1 table, 8 refs. (Author)

1791. Bohnke S
FIRE-FIGHTING SUIT
Austrian Patent No. 327,012; Cl 61 A 007/01, (A62C 039/00), Appl 8 Jul 1968, Discl. 12 Jan 1976

A patent is disclosed for a fire-resistant suit with several protective layers, a breathing apparatus between them, and with protective mittens of one piece with the sleeves. 9 drawing figs. (RZh)

1792. James AA
IMPROVEMENTS IN OR RELATING TO A BODY HARNESS
UK Patent No. 1,420,783; Cl A3V, (A62B 35/00, F16G 11/00), Appl 25 Apr 1974, Discl. 14 Jan 1976

A rescue device with the main equipment sewn into the fireman's jacket is patented. With this device a fireman can descend from highrise buildings by himself or holding a casualty. The equipment includes a sturdy belt, consisting of the belt itself and a second strap which can be looped downward to form a soft seat 100 (see the figure) in conjunction with the belt. On both sides of the main belt are two snap hooks through which the nylon rescue line 102 passes in front of the firefighter and, as it tightens, presses against him to provide the necessary friction. The firefighter holds the upward portion of the line in his left hand; the descending portion is held by the right hand via the snap hook, regulating descent. The upper end of the line is fastened to a suitable portion of the building by means of a snap hook; the lower end dangles to the ground. The rescue equipment can be used without the jacket. In this case it weighs about 0.9 kg. 14 drawing figs. (RZh)

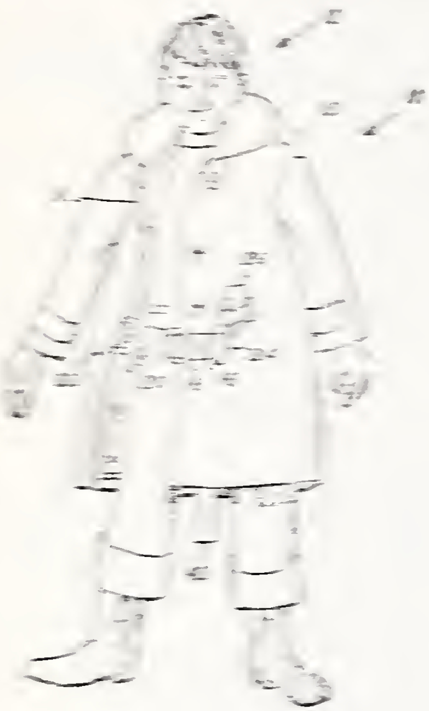


1793. Hutchinson JM
DETACHABLE HARNESS FOR FIREMAN'S COAT AND THE LIKE
US Patent No. 3,973,643; Cl 182/3, (A62B 35/00), Appl 30 Dec 1974, Discl. 10 Aug 1976

7. FIRE SERVICE ORGANIZATION AND FACILITIES

g. Personal Equipment—Continued

A harness is combined with a fireman's turnout coat or similar protective garment of the type adapted to fit about the torso. A belt is provided that encircles the waist and includes a D-ring and snap, each on opposite sides of the belt, for joining the belt together. Releasable fasteners on the inside of the coat allow the belt to be releasably attached thereto. A groin strap is carried by the belt and is adapted to extend between the legs of the wearer so that a snap on the free end thereof may be joined to the D-ring during use. An additional fastener on the inside of the coat allows the strap to be held in a stored position against the inside of the coat when not in use. 7 claims, 3 drawing figs. (Author)

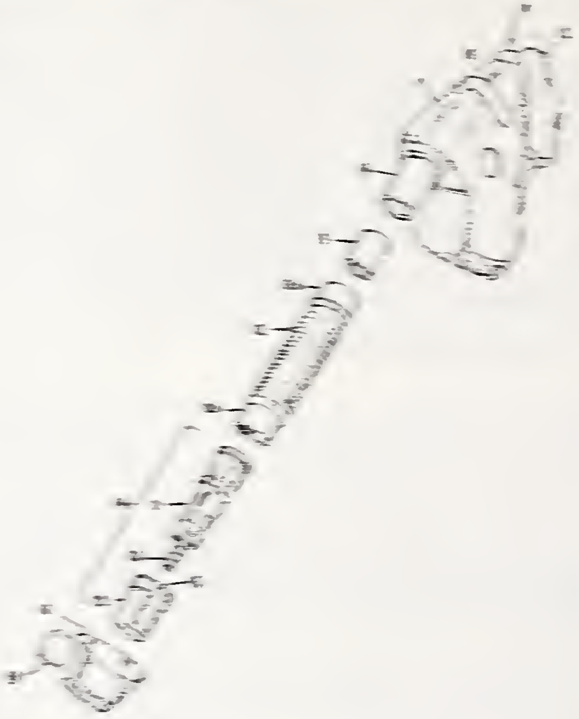


1794 Vina Le.

BREATHING MASK AND VARIABLE CONCENTRATION OXYGEN DILUTING DEVICE THEREFOR

US Patent No. 3,977,432 (Cl. 137/604; (F16K 15/00). Appl. 13 Jan 1975. Dated 31 Aug 1976. Assignee: American Hospital Supply Corp., Evanston, Ill.

An improved oxygen mask, particularly useful for treating patients requiring inhalation therapy, wherein the extent of oxygen dilution with room air may be selectively controlled to provide different predetermined oxygen concentrations. The diluter is interposed in the line between the inlet inlet of the mask and the oxygen supply line and essentially comprises two closely fitting parts, a tapered tubular body which houses an integral ejector nozzle, and a tapered tubular sleeve that is fitted upon the body for rotational movement into any of a plurality of selected positions but is securely locked against axial movement upon that body. The parts have apertures that are moved into or out of alignment as the sleeve is rotated into different angular positions of adjustment. An aerosol adapter may be removably mounted upon a projecting end portion of the body for directing vapors toward the inlet apertures of the diluter. 8 claims, 5 drawing figs. (Author)



1795 Dumchalatze GL and Gazarov BN

PROTECTIVE MITTENS

USSR *Patent No.* 497,021 (Cl. A41D 13/08). Appl. 21 Feb 1972. Dated 7 Jan 1976. Assignee: VNII okhrany truda VTsSPS

Mittens designed to protect the hands from being burned when exposed to intense heat radiation and high ambient temperatures are described. The mittens consist of palm and back sides and removable covers. The novelty of the gloves consists in the increased thermal-protection properties between the cover and back side of the mittens which is achieved by fastening transverse elastic elements to the back side of the mittens, the cover and mittens being held together by buckles. The mittens are made of a multi-layered material; the distinguishing feature of the covers is the heat-reflective fabrics from which they are made. 2 drawing figs. (RLb)

1796 Isaev AP

METHOD OF DETERMINING THE DEAD SPACE IN THE FACEPIECE OF A PROTECTIVE MASK

USSR *Patent No.* 495,741 (Cl. A62B 27/00). Appl. 17 Jul 1972. Dated 15 Jan 1976. Assignee: VNII gornospasatel'nogo dela

A method of determining the dead space in the facepiece of a protective mask is proposed. The method consists in tapping samples of the gas mixture in the dead space and in mass-spectrometric analysis of the concentration of carbon dioxide in the samples. The distinctive features of the method are as follows: in order to increase the accuracy of determining the volume of the dead space without interrupting breathing of the user and to optimize the choice of a mask design, the samples of gas mixture are tapped by a capillary sampler through the walls of the mask in various areas at several points and various depths and the desired volume is calculated from the results of mass-spectrometric analysis of the concentration of carbon dioxide. (RZh)

h. PERSONNEL AFFAIRS

1797. Pantoga F
WOMEN FIREFIGHTERS — A SURVEY
Fire Chief; 21(1):51-54, 1977

Women firefighters and fire chiefs throughout the country were interviewed for this survey. The three questions involved in the survey were the capability of women to do the job, accommodations in the station, and duty assignment. The consensus of opinion is that departments around the country will one day have women firefighters.

1798. Considine W, Misner JE, Boileau RA, Pounian C, Cole J and Abbatiello A
DEVELOPING A PHYSICAL PERFORMANCE TEST BATTERY FOR SCREENING CHICAGO FIRE FIGHTER APPLICANTS
Publ Pers Manage; 5(1):7-14, 1976

The criteria and methodology employed in the selection process for firefighter and law-enforcement personnel have become of increasing concern to municipal, state and federal agencies as selective criteria and the types of evaluative instruments utilized have been challenged in the courts. Within this climate of challenge and faced with the expiration of a firefighter eligibility test, the Chicago Civil Service Commission made a major commitment to undertake a research project designed to develop a unique approach to selection of applicants to the Chicago Fire Department. The final physical performance battery selected consisted of a modified man-lift-and-carry, a stair climb, a modified obstacle run, a flexed-arm hang, and a hose couple. The recommended test battery has been administered to approximately 10,000 firefighter applicants. Follow-up research to determine effectiveness and potential predictive validity is planned. 6 figs, 3 refs.

8. FIRE OPERATIONS: PREVENTION AND SUPPRESSION

a. COMMUNICATIONS AND SIGNALLING

1799. Nailen RL
VOICE ALARM SYSTEMS OFFER CHOICE OF HANDSET OR HANDS-FREE BOXES
Fire Eng; 130(2):48-51, 1977

The author discusses the history of failures with the alarm box system, due chiefly to the soaring false alarm rates, and suggests these alternatives: removal of the street box system, substitution of the 911 telephone call system (not always an adequate solution) or voice alarm systems, known as EVCS (emergency alarm communications systems), either the handset type with a telephone handset mounted in a street box or the hands-free system, using a loudspeaker in the box as both transmitter and receiver. The advantages and disadvantages of the two EVCS systems are compared. 4 photos.

1800. Alibatov K and Kasymbekov S
THE NOVOSIBIRSK FIRE CONTROL CENTER
Pozhar delo; (7):28-29, 1976 (Russian)

The authors describe the control center of the fire department in Novosibirsk (USSR). The experience gained in other communications centers was used in the design and planning. All calls are picked up and recorded automatically. Some fireground response problems are programmed and are handled automatically. An illuminated map of the city and its environs gives the dispatcher a good overall picture and helps him in making decisions. 1 fig. (Fachdok 13/0206)

1801. Vogt G
VOICE AND DATA COMMUNICATIONS FOR FIRE DEPARTMENTS — DEVELOPMENT STATUS AND SYSTEMS OF THE FUTURE
VFDB Z; 25(4):110-114, 1976 (German)

The most revolutionary step in the development of voice and data communications in the past was the changeover from tube to semiconductor techniques. The subsequent development of small, powerful sets is essentially finished. The trend now is to improve the transmission characteristics. The multi-channel set FuG 8a/8b, the 5-tone call technique, and computerized radio information and reporting systems are cited as examples of recent developments. Central control installations, ie, centralization of alarm, control, and supervisory facilities of all kinds, must be thought out in detail. It must be possible to build them in stages, and they must be automated as fully as possible. A closed system is the tunnel communications system (Elbe River tunnel) and the quasi-continuous-wave system. These systems, which are especially important for fire departments, are described. (This paper was presented at the Technical and Scientific Committee sessions of the 1976 VFDB Annual Professional Meeting in Berlin.) 11 figs. (Fachdok 13/0103)

1802. Crowell KE and Brettman WM
SEALED SWITCH ACTUATOR
US Patent No. 3,932,721; Cl 200-302, (H01H 13/06), Appl 3 Feb 1975, Discl. 13 Jan 1976, Assignee: Motorola, Inc, Chicago, IL

A patent is disclosed for a sealed, weather-resistant switch actuator to be used in portable electrical and electronic apparatus, eg, a portable radio for communications in fire units. The switch actuator arrangement fits in a special recess in the associated radio apparatus and is covered with a special kind of membrane made of flexible plastic that does not react to weather effects.

8. FIRE OPERATIONS: PREVENTION AND SUPPRESSION

a. Communications and Signalling—Continued

1803. Korschinsky J
EXPERIENCE WITH A RESPONSE CONTROL COMPUTER IN PROFESSIONAL FIRE DEPARTMENTS
Fire Protection Seminar, Internat, 5th, Papers, Vol 2; 1976, Sep 22-24, Karlsruhe, FRG, pages 285-297 (German)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

Since 1975 the first computer-controlled response center, System EZ 2000, has been in operation in the main fire station in Augsburg (FRG). The equipment of response centers for public safety services has thus received a new dimension. The accumulating volume of work is handled more certainly, is accelerated, is made easier, data handling is systematized, and highly interesting perspectives are opened up in the area of future development of communications-engineering and data-engineering installations. (Author)

b. EXTINGUISHING AGENTS AND ADDITIVES

1804. Altman RL
EVALUATION OF DRY CHEMICAL FIRE EXTINGUISHANTS
Arch Termodyn Spal; 7(4):557-562, 1976

This paper briefly describes a large-scale method of determining the potential chemical effectiveness of dry powders as extinguishants of hydrocarbon-air fires. Of two dry powders with identical delivery rates, the powder that is capable of extinguishing a propane-oxygen-nitrogen flame of greater oxygen content is ranked superior. The chemicals discussed are some of the bicarbonates, chlorides, cryolites, nitroprussides and phosphates of the alkali metals and ammonia. 6 figs, 1 table, 3 refs. (Author)

1805. Anon
DEFINITION OF EXTINGUISHING EFFECTS
Brand aus; 84(11):443-444, 1976 (German)

For a better understanding of the effectiveness of extinguishants, the principal and secondary extinguishing effects are described in the guidelines on "Quantities of Extinguishants Needed for Mobile Response in Fire Fighting and for Fixed Extinguishing Systems." The principal extinguishing effects are stated to be cooling, choking, inhibiting, and wall effect. The secondary effects are vaporization, dilution, displacement, separation, blanketing, damming, emulsifying, equalizing, wetting and long-term effects. These effects are defined in detail. (Fachdok 13/0220)

1806. Huebner H
TECHNICAL USE OF AIR FOAM
Schweiz Feuerwehr Z; 102(11):417, 419, 421-424, 1976 (German)

The broad range of use of air foam in fire-extinguishing technology makes it necessary to know about the application and properties of foam concentrates. This article defines some of the common concepts, such as expansion factor and water retention capability, and gives information on the foam proportioning and generating devices and their operating principles. A table gives a survey of the possibilities of producing low-, medium-, and high-expansion foam using various foam concentrates. Two formulas are given for approximate calculation of the foam-concentrate and water requirements as a function of the area to be covered. 6 figs, 1 table. (Fachdok 13/0192)

1807. Hellmann H
FOAM EXTINGUISHANTS — POTENTIAL WATER POLLUTION
Tenside Deterg; 13(5):270-273, 1976 (German; English Summary)

A chemical, physical and biochemical study was made of 38 foam extinguishants from 8 suppliers with respect to potential water pollution. The individual products differed in decomposition behavior and toxicity. As a rule, extinguishants with a protein base do not decompose as readily as those with a synthetic base. The toxic effect is also variable. Products with strong additions of zinc are relatively toxic. Surfactants are particularly harmful to fish. The potential detrimental effects on ground water and flowing water and, in particular, on relatively small bodies of stagnant water are emphasized, as is the dilution required when foam extinguishants, after being used, are drained off into a biologically clarifying treatment plant. Finally, target goals for products not detrimental to the environment were advanced. 4 figs, 3 tables, 5 refs. (Fachdok 13/0153)

1808. Steinbach K
PROBLEMS OF CORROSION BY WETTING AGENTS AND MULTIPURPOSE FOAM CONCENTRATES
Unser Brandschutz; 26(10):30-32, 1976 (German)

In the course of efforts to achieve a 30% reduction in losses from corrosion in all branches of the economy of the GDR, measures have been introduced in the fire service for better corrosion protection of high-grade fire-fighting equipment. A study is made of the devices and components that are most susceptible to corrosion and of the long- and short-term measures that need to be taken, such as the development of an appropriate maintenance program, investigation of the behavior of materials toward wetting agents and foam concentrates, correct selection of materials and protective systems, and finding substances that are less corrosion-promoting as foam-concentrate components. 1 table. (Fachdok 13/0106)

1809. Pless G and Kretschmar A
UNIFORM METHODS OF EVALUATING THE QUALITY OF FOAM CONCENTRATES
Unser Brandschutz; 26(11):29-30, 1976; 26(12):30, 1976 (German)

The All-Union Fire Protection Institute of the USSR, in collaboration with the Fire Protection Institute of the GDR, has developed a common guideline for the laboratory investigation of foam concentrates. Given in the guideline are test methods for determining the basic chemical, physical and other properties, as well as the quality of foam concentrates and their solutions, as follows: external state, precipitate, density, viscosity, minimum application temperature, corrosiveness, surface tension, wettability, expansion ratio, and foam stability. The foam concentrates commercially available in the GDR and USSR were studied by these methods. 2 figs. (Fachdok 13/0238)

8. FIRE OPERATIONS: PREVENTION AND SUPPRESSION

b. Extinguishing Agents and Additives—Continued

1810. Anon
INCREASING EXTINGUISHING EFFICIENCY WITH THE NEW FINIFLAM-MILTIPURPOSE WETTING AGENT AND FOAM CONCENTRATE
Unser Brandschutz; 26(11):31-32, 1976 (German)

The properties of the new wetting agent and foam concentrate being produced by the VEB Pirna-Copitz Chemical Factory (GDR) are reported in this article from the company. As a wetting agent it is added to the water in the amount of 1 vol %, appreciably reducing the extinguishing time and expenditure of extinguishant compared to the former E 30 agent. An admixture of 5 vol % is required to produce high-, medium-, and low-expansion foam. These foams exhibit great stability. The agent can be kept in airtight containers for an unlimited period of time. 3 figs, 1 table. (Fachdok 13/0262)

1811. Broell R
MECHANICAL FOAM FIRE EXTINGUISHANTS. PART 1
VFDB Z; 25(4):146-150, 1976 (German)

In the first part of this review article on mechanical foams the author gives a definition and the uses of foam compounds and describes the different types of foams: protein, fluoroprotein, synthetic, aqueous film-forming, and special types of protein foam compounds, and then discusses the generation of mechanical foams, their characteristics, yield, stability, flow tendency, extinguishing capabilities, and resistance to burning.

1812. Baratov AN
NEW FIRE EXTINGUISHANTS
Zh Vses Khim O-va; 21(4):369-379, 1976 (Russian)

A review of information on new fire extinguishants is given. The conditions for the suppression of combustion are analyzed and principles for classifying fire extinguishants are proposed. Information on the mechanism of the fire-extinguishing effect of various extinguishants and on ways of increasing their effectiveness is presented. Data on new fire extinguishants are reported: light water, additives that increase the fire-extinguishing efficiency of water, anaqueous foams, foams filled with Halon, bromo-Halon, and powders. The advantages and disadvantages of the various extinguishants are analyzed and the outlook for the development of new effective extinguishants is considered. 3 figs, 8 tables, 26 refs. (Author)

1813. Abduragimov IM
FIRE EXTINGUISHANTS AND METHODS OF USING THEM
Zh Vses Khim O-va; 21(4):379-387, 1976 (Russian)

The possibilities for increasing the fire-extinguishing effectiveness of agents by optimizing methods of applying them to the zone of combustion are demonstrated on the basis of examples of extinguishing fires of combustible fluids and solid combustible materials. Mechanisms for increasing the fire-extinguishing effectiveness of foam concentrates of the "light water" type and of aqueous solutions of higher viscosity are examined in greater detail. Given first are estimative calculations of the minimum required water flows for extinguishing solid combustible materials by establishing a heat balance in the surface layer of the material. It is shown that the efficiency of water can be increased by increasing the flow rate in extinguishing fires of solid combustible materials. Some results of studies aimed at increasing the fire-extinguishing effectiveness of various extinguishants are presented. 4 figs, 2 tables, 23 refs. (Author)

1814. Ksandopulo GI
EXTINGUISHING PROPERTIES OF SUBSTANCES UNDER GAS AND POLYMER FLAME CONDITIONS
Zh Vses Khim O-va; 21(4):396-402, 1976 (Russian)

Examples of extinguishing flames of gas mixtures are examined from the viewpoint of the effect of inhibitors on the structure of the flame front, as are optimal variants of the inhibiting effect of substances. The active additives can be dry powders whose surfaces are effectively damped by R, RO_2, H, OH, HO_2 and other radicals. An additional possibility exists for inhibiting the combustion process in polymer flames. The specific features of the inhibiting effect in this case consist, on the one hand, in slowing down the process of gasification of the polymer and, on the other hand, in forming a layer with a lower thermal conductivity than that of the polymer. To be considered as effective polymer flame suppressants, aside from brominated Halon, are also dry powders that reach the burning surface and actively retard the chain-breaking process induced by diffusion of the oxidant into the surface of the polymer. 1 table, 114 refs. (Author)

1815. Kaminstein B and Uhl WF
GELLED FIRE EXTINGUISHER FLUID COMPRISING POLYACRYLAMIDE AND BENTONITE
US Patent No. 3,976,580; Cl 252/2, (A62D 1/00), Appl 7 Nov 1975, Discl. 24 Aug 1976

A fire extinguisher fluid comprising an aqueous gel containing as gelling agent a combination of polyacrylamide and bentonite, particularly a mixture of 0.5 parts polyacrylamide and 2.7 parts bentonite, per 100 parts of water, by weight. The gelling components are incorporated in water in the proper proportions, and a stream of the resulting aqueous gel is applied to a burning area, to form a wet cool blanket thereover and inhibit further burning. 30 claims. (Author)

1816. Globus AR
OIL AND GASOLINE FIRE EXTINGUISHING COMPOSITION AND METHOD OF MAKING
US Patent No. 3,979,302; Cl 252/2, (A62D 1/00), Appl 19 Mar 1974, Discl. 7 Sep 1976, Assignee: Guardian Chemical Corp, Hauppauge, NY

A patent is disclosed for an oil and gasoline fire extinguishing composition comprising a polymerized (hydrated amide-amine) complex formed from at least one fatty acid having 8 to 18 carbon atoms and at least one dialkanol amine having 1 to 6 carbon atoms per alkanol group. (Author)

1817. Nii R
A REVIEW OF STUDIES OF EXTINGUISHMENT EFFECTS, TEST METHODS AND APPLICATIONS OF EXTINGUISHANTS IN JAPAN
Fire Protection Seminar, Internat, 5th, Papers, Vol 2; 1976, Sep 22-24, Karlsruhe, FRG, pages 107-125 (German)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

8. FIRE OPERATIONS: PREVENTION AND SUPPRESSION

b. Extinguishing Agents and Additives—Continued

In Japan the installation of fixed extinguishing systems is required for every building subject to the fire protection law, including hospitals, highrise buildings, stores, buildings in underground malls, etc, as well as industrial facilities, such as natural oil refineries and chemical plants, where fire-hazardous materials are handled or stored in appreciable quantities. For this reason the Japanese Fire Protection Agency has charged the Research Institute to establish the technical principles for the quantities of extinguishants used in extinguishing systems. In order to fulfill these administrative requirements as well as possible, studies have been carried out in the institute by Yamashika *et al* on problems of the extinguishing effects of gaseous and dry-powder extinguishants and by Nii *et al* on test methods and applications of extinguishants for the last ten years. An important portion of the work by Yamashika on the theoretical critical discharge rate of gaseous and dry-powder extinguishants used in extinguishing systems and an example of application for various extinguishing systems is summarized in Table 1. Summarized in Table 2 is the work done by Nii *et al* on test methods to establish the extinguishing efficiency of various extinguishants and applications of "light" foam at fire sites. In this review the author identifies the difficulties encountered in the field of study of extinguishing methods and makes some suggestions for international cooperation. 3 figs, 3 tables, 38 refs. (Author)

1818. Brein D
THE EFFECTIVENESS OF DRY-POWDER EXTINGUISHANTS IN LABORATORY TESTS
Fire Protection Seminar, Internat, 5th, Papers, Vol 2; 1976, Sep 22-24, Karlsruhe, FRG, pages 155-168 (German)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

The increasing use of dry-powder extinguishants in firefighting is attributable to the advantages of these extinguishants in the most varied applications. In the last few years various test methods have been developed to gain both quantitative and qualitative insight into the effectiveness of dry-powder extinguishants in extinguishing various classes of fires. After a brief review of the test methods known from the literature, the laboratory tests for class B and C powders and for glowing-fire powders that have been developed at the Fire Protection Engineering Research Center (Karlsruhe, FRG) are discussed in detail. The test results are demonstrated and explained by means of tables and diagrams. 8 figs, 1 table, 3 refs. (Author)

1819. Broell R
STATUS OF AIR FOAM EXTINGUISHANTS AND THEIR AREAS OF APPLICATION
Fire Protection Seminar, Internat, 5th, Papers, Vol 2; 1976, Sep 22-24, Karlsruhe, FRG, pages 169-182 (German)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

The four presently known types of foam compounds are discussed in the introduction, namely, protein, fluoroprotein, synthetic, and aqueous film-forming. Then the characteristics of the different foams and compounds are identified: expansion ratio, water half-life, fluidity, and resistance to combustion. Comparative extinguishing tests on small fire pools and a fire area of up to 500 m² characterize the capacity of the various foams to extinguish a selected hydrocarbon. Finally, the varying extinguishing effects are discussed, potential areas of application for the different foams are proposed and unanswered questions are identified. 4 tables. (Author)

1820. Petrov I and Reutt V
FIRE-FIGHTING EFFECTIVENESS OF AIR FOAMS
Fire Protection Seminar, Internat, 5th, Papers, Vol 2; 1976, Sep 22-24, Karlsruhe, FRG, pages 183-193 (German)
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

Given is a criterion for the determination of the fire-fighting effectiveness of foams. It is shown that their effectiveness can be increased by a factor of two to three by choosing optimum expansion and structure of air foams produced from aqueous solutions of synthetic concentrates. The standard or optimum intensity of foam discharge and the calculated extinguishment time during fire-fighting operations are determined. 3 figs, 1 ref. (Author)

1821. Miller MJ
THE USE OF HALONS FOR FLAME SUPPRESSION
Fire Protection Seminar, Internat, 5th, Papers, Vol 2; 1976, Sep 22-24, Karlsruhe, FRG, pages 195-219
Sponsor: Vereinigung zur Foerderung des Duetschen Brandschutzes eV.

This paper describes the various applications of Halon systems and includes comments on the factors that should be considered in their choice and design. Particular attention is given to agent concentration requirements for fire suppression, explosion prevention ("inerting"), and explosion suppression. Current research is also summarized. 10 figs, 120 refs. (Author)

c. HYDRAULICS AND WATER SUPPLIES

1822. Ely R
FLOW METERS GIVE ACCURATE MEASUREMENTS OF FIRE STREAMS
Fire Chief; 21(2):28-29, 1977

The benefits of using flow meters on pumpers to simplify the measurement of fireground streams are explained. Also shown is how they can be used for testing pumpers. 2 photos. (Author)

1823. Johnson RJ
WATER AUGMENTATION SYSTEM
Fire Chief; 21(2):33, 1977

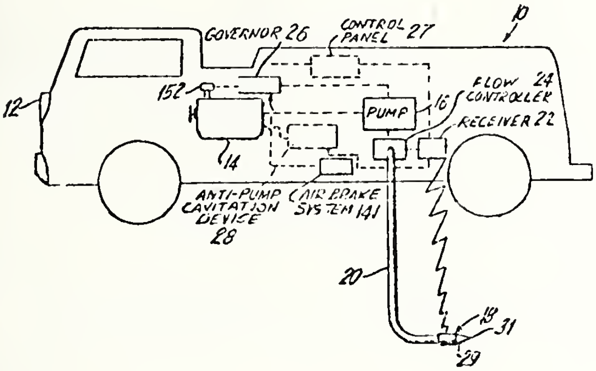
City water pumps are automatically started by signals generated by the actuation of sprinkler systems in industrial buildings subscribing to the water augmentation system. This provides additional pressure and flow for fire-suppression equipment. (Author)

1824. Nelson GR, Jr and Kaplan H
METHOD AND APPARATUS FOR DELIVERING CONSTANT WATER FLOW RATES TO A FIRE HOSE AT EACH OF A PLURALITY OF SELECTABLE FLOW RATE SETTINGS
US Patent No. 3,974,879; Cl 169/43, (A62C 27/00), Appl 14 Feb 1975, Discl. 17 Aug 1976, Assignee: Grumman Aerospace Corp, Bethpage, NY

8. FIRE OPERATIONS: PREVENTION AND SUPPRESSION

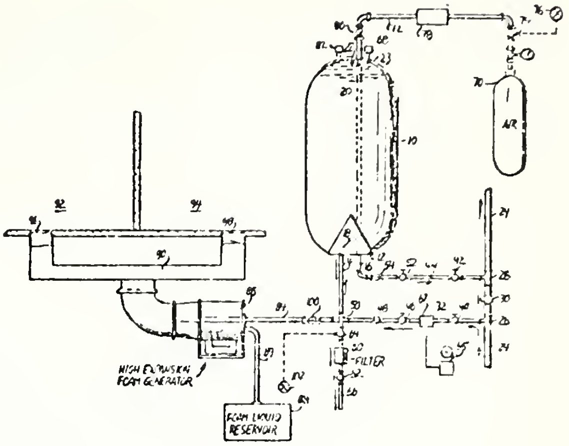
c. Hydraulics and Water Supplies—Continued

A method and apparatus for delivering constant water flow rates to the fire hose of a pumper truck at each of a plurality of selectable flow-rate settings, including the steps of transmitting a digital signal corresponding to a particular fire hose and pumper truck, receiving and decoding the digital signal, activating a multi-position valve in response to the decoded signal to set a particular valve position, and maintaining a constant flow rate to the fire hose by automatically varying the valve position in response to changes in the output pressure of the pump and pressure drop in the fire hose. 8 claims, 9 drawing figs. (Author)



1825. Boegli P
EMERGENCY RESERVE WATER AND FOAM GENERATING SYSTEM
US Patent No. 3,977,474; Cl 169/9, (A62C 35/00), Appl 27 Jan 1975, Discl. 31 Aug 1976

A method and apparatus are disclosed for providing a supply of fresh water during emergency situations when the normal fresh water source is interrupted and for generating a high volume of air-water foam for extinguishing fires. The emergency system is connected to the normal fresh water source at the place of installation and diverts the fresh water through a standby tank to continually replenish the tank with fresh water. In the event of fire, a regulated source of high-pressure gas is supplied to the tank to expel the water at high pressure through a high-expansion foam generator, the foam outlet of which communicates with the spaces of the building or other installation in which the system is installed. The standby tank of reserve water may be positioned above or below ground level according to alternate embodiments of the invention. Other embodiments are disclosed wherein a separate foam-generating installation for extinguishing fires is adapted for use with one or more foam generators. According to a further embodiment of the invention, a compact, self-contained foam-generating system is disclosed, several of which may be strategically placed in various locations throughout a building or the like for extinguishing fires in the vicinity. 8 claims, 5 drawing figs. (Author)



d. INSPECTION

1826. Bahme CW
WHEN IS YOUR INSPECTOR LIABLE?
Fire Command; 44(2):21-23, 1977

Any member of the department who engages in fire inspection activities, regardless of his civil-service title, becomes a fire inspector, a law-enforcement officer, while so engaged. Legal liabilities are applicable to each of them, not just to the member with the inspector badge. The questions of civil and criminal liability, judicial, or discretionary, and ministerial, or non-discretionary, duty, and other aspects of legal consequences are discussed.

e. OPERATIONAL PROBLEMS

1827. Parker MW, Rosenham AK and Demeranville MI
HOW COMPUTER SIMULATION WORKS
Fire Chief; 21(1):57-58, 1977

The use of systems analysis, in particular, simulation, can answer questions that are impossible or, at best, difficult to answer in any other way. The example given in the article shows a straightforward answer to the question of the number of fires that have to wait for a given number of pumpers.

1828. Hunt RL
FIGHTING THE MOBILE HOME FIRE
Fire Command; 44(2):18-20, 1977

The director of loss prevention of the Zimmer Homes Corporation, Pompano Beach, Florida, describes the problems involved in fighting mobile home fires, among them the extensive use of toxic-gas and smoke-producing plastics, the open area extending the length of the house between the metal roof and ceiling, a wind-tunnel effect in single-wide units due to hall design, and the fact that it is usually completely encased by metal, except for the floor. Rapid flashover is frequent. The flashover or backdraft conditions of forcible entry and ventilation are stressed. It is recommended that the fire be fought with small lines and fog patterns within the home and that utility connections be cut off.

1829. Anon
ENSURING THE BEST USE OF FIRST AID FIRE EXTINGUISHERS
Fire Prot Rev; 40(434):26-27, 1977

To ensure that first-aid fire extinguishers serve their purpose, they must supply an adequate amount of extinguishant suitable for the particular class of fire involved, and the extinguishant must be applied effectively by the operator. Given an extinguisher suitable for the class of fire likely to be encountered and designed for ease of operation, even unskilled users should be capable of dealing with most small fires. The information presently available is considered to assist potential users.

f. PUBLIC EDUCATION AND PUBLIC RELATIONS

1830. Fuller MK
FIRE PREVENTION EDUCATION
Davis Publishing Co, Inc, Santa Cruz, CA; 95 pages, 1976

The format and content of this publication are highly unusual. There are lesson plans for each grade from kindergarten through the sixth, and there are lists of films, film strips and books that a teacher can use to supplement the formal presentations suggested in the outlines. There are also sections with puzzles, worksheets, tests, drawings to be colored, and take-home materials. The "book" is padded, rather than bound, so that pages in these sections can be removed and duplicated on a copying machine for distribution to students. All pages are punched so that they can be kept in a three-ring binder.

1831. Jocek PE
KEEPING PACE WITH THE GROWING COMMUNITY
Fire Command; 44(2):25-26, 1977

The need for an organized public relations program for the purpose of, eg, improving insurance ratings, improving the department's relations with minority groups, or convincing the public of the department's needs, is discussed. Ways and means of implementing public relations programs are outlined.

1832. Maguire HM
SEATTLE STRESSES HOME SMOKE DETECTORS IN NEIGHBORHOOD MEETINGS AFTER A FIRE
Fire Eng; 129(12):27-28, 1976

In neighborhood meetings after a fire, the "Code Red" program of the Seattle, Washington, Fire Department gathers fire victims, neighbors, combat firefighters and civilian home inspectors to discuss the fire, analyze the causes, critique the firefighters' actions and establish a program of fire safety, the main thrust of the program being directed at the use of smoke detectors as early warning devices to save lives and property. The program is outlined and illustrated by examples. The success of the public relations and fire prevention program is emphasized. 3 photos.

1833. Anon
PUBLIC EDUCATION CAN MAKE A DIFFERENCE
Minn Fire Chief; 13(3):16-17, 31, 1977

For the abstract of this article, reprinted by permission from *Fireword*, see the abstract for the same article in *Southern Building*, 20-22, Dec-Jan 1976/77.

1834. Anon
PUBLIC FIRE EDUCATION CAN MAKE A DIFFERENCE
South Build; :20-22, Dec-Jan 1976/77

Public fire education through media programs and community education programs as they relate to the functions of the Public Fire Education Office (PFEO) of the National Fire Prevention and Control Administration are discussed. Some examples are cited. (The article is reprinted by permission from *Fireword*.)

g. RESCUE OPERATIONS

1835. Haertling D
A BASKET FOR SAFETY. THE RESCUE AND WORK BASKET OF AERIAL-LADDER RESCUE VEHICLES
Brandschutz; 30(11):284-287, 1976 (German)

The safety requirements for rescue and work baskets (accident prevention regulation "Fire Service") and the safety rules for rescue and work baskets of aerial-ladder rescue vehicles (1974) are discussed in this article. Shortly after these safety rules were published, the Carl Metz GmbH, Karlsruhe, and Magirus-Deutz AG, Ulm (FRG), unveiled two baskets that comply in design with these safety regulations. The configuration and technical design of these new-generation baskets, which, if properly handled, provide optimal safety in rescue and extinguishing operations, are described. 7 figs, 3 refs. (Fachdok 13/0096)

1836. Anon
TECHNICAL SPECIFICATIONS FOR FIRE RESCUE EQUIPMENT
Ohm: denki zasshi; 63(3):264-281, 1976 (Japanese)

Technical specifications are given for several types of fixed emergency-rescue equipment to be used during fires to evacuate people and property from standard and multistory buildings, as developed by the Standardization Group of the Japanese Ministry of Construction. The important feature of these specifications is that they have been recommended as world standards because of the high technical quality of the equipment. The principal type of equipment regulated by these specifications is the emergency fire ladder, as well as a relatively new type of rescue means to be used in fires, a collapsible cylindrical elastic chute equipped with a special connecting sleeve to be attached to the outside of window openings of buildings. In case of fire, the chute, which is folded into a coil of 0.5-2.3 m diameter, is lowered with one end fixed to the window opening. The end that has been lowered to the ground is held by one or two people at some distance from the building so that whatever descends through the chute has an inclined trajectory and does not develop too much speed, which would make it difficult to stop. More effective designs of these rescue chutes are presented, as are some optimal dimensions recommended as standards. Also regulated are fire-safety dimensions for certain standardized components of stairwells and other building components. 17 figs, 2 tables. (RZh)

1837. Fujita T and Shibata H

OPTIMIZATION OF THE STRATEGY OF EVACUATION FROM SPREADING FIRES CAUSED BY A STRONG EARTHQUAKE. PART 2

Seisan kenkyu; 28(3):142-145, 1976 (Japanese)

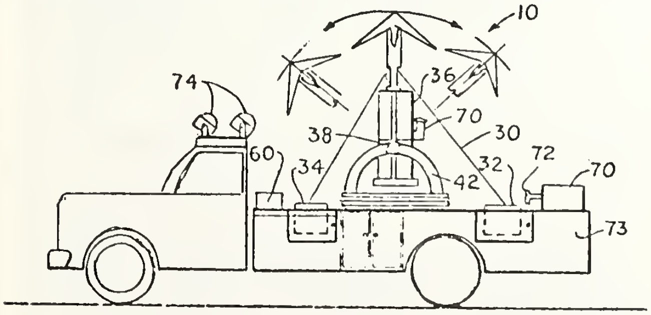
The choice of an optimal strategy and routes for the evacuation of people in the case of fire resulting from earthquakes in large cities is an urgent problem for Japan, which is subjected to frequent seismic events of varying intensity. The development of several new evacuation plans for various Japanese cities is reported. It is noted that an effective solution of this problem in general form can be found only by an analytical approach using machine methods of processing information because physical modeling cannot take into account all the statistical factors and the problem can be solved only under specific conditions applied to individual cases. A description is given of a method of applying topological theory to the problems of predicting fire spread routes within the precincts of a large modern city for the case of a single fire source (center) near the center of the city. If there are several fire centers, as is usual for a severe earthquake, the problem becomes somewhat more complicated and must be solved by the method of superposition of several topological charts, each made up for a corresponding single fire center. Also analyzed are some problematical questions connected with the evacuation of people by surface transportation, in particular, calculation of the optimal traffic capacity of highways. 4 figs, 7 refs. (RZh)

1838. Hayslip RWE

RESCUE APPARATUS

US Patent No. 3,972,386; Cl 182/50, (A62B 1/18), Appl 23 Dec 1975, Discl. 3 Aug 1976, Assignee: Lawrence Peska Associates, Inc, New York, NY

A rescue apparatus is disclosed comprising a projectile launched from a launching tube, one end of the projectile having grappling hook members projecting therefrom, the opposite end of the projectile having fins for stabilizing the projectile in flight and a pulley mounted intermediate the ends for receiving a rope that is played out from two storage containers separated a sufficient distance so that the rope does not entangle with the fins of the projectile when the projectile is in flight. Once the grappling hook is set in an area where a rescue is to be attempted, such as the roof of a building, the rope may be used to raise a ladder to that point where the grappling hook is secured. A winch is also provided for assisting in either raising the rope or other apparatus needed in the rescue operation. 9 claims, 5 drawing figs. (Author)

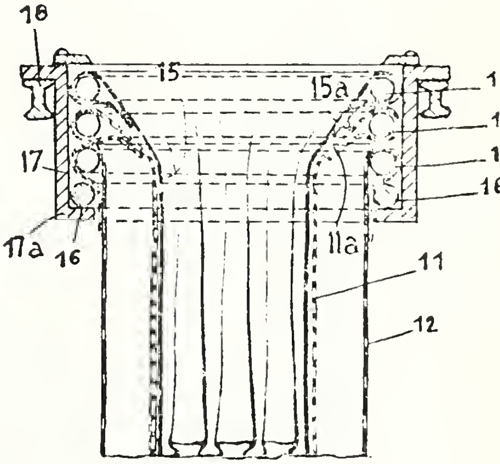


1839. Zephinie G

RESCUE APPARATUS

US Patent No. 3,973,644; Cl 182/47, (A62B 1/20), Appl 6 Jun 1974, Discl. 10 Aug 1976, Priority: France, Appl No 74.20410, 5 Jun 1973, Assignee: Societe Soberal SA, Luxemburg

This invention, relating to a rescue apparatus for enabling persons to escape safely from burning buildings, comprises a flexible tubular device that is elastic only in the transverse and circumferential direction to slow the rate of descent of a body falling through the tubular device, various means being provided for fixing the open upper end of the tubular device to the elevated point whence the body or person is to be rescued through the lower open end of the device at a point therebelow. 6 claims, 11 drawing figs. (Author)



1840. Zephinie G

RESCUE APPARATUS

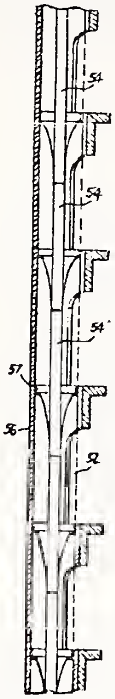
US Patent No. 3,977,495; Cl 182/48, (A62B 1/20), Appl 16 Apr 1975, Discl. 31 Aug 1976, Priority: France, Appl No 73.20410, 5 Jun 1974, Assignee: Societe Soberal SA, Luxemburg

This invention, relating to a rescue apparatus for enabling persons to escape safely from burning buildings, comprises a flexible tubular device that is elastic only in the transverse and circumferential direction to slow

8. FIRE OPERATIONS: PREVENTION AND SUPPRESSION

g. Rescue Operations—Continued

the rate of descent of a body falling through the tubular device, various means being provided for fixing the open upper end of the tubular device to the elevated point whence the body or person is to be rescued through the lower open end of the device at a point therebelow. 3 claims, 11 drawing figs. (Author)



1841. Baldwin R, Melinek SJ and Appleton IC
EVACUATION OF BUILDINGS
Fire Protection Seminar, Internat, 5th, Papers, Vol 2; 1976, Sep 22-24, Karlsruhe, FRG, pages 71-83
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

This paper examines some of the data underlying the calculation of exit capacity and escape times from buildings in evacuation standards. Data on crowd movement are used to predict the time necessary to evacuate buildings of varying dimensions and density of occupation, and then to examine the costs of escape requirements in buildings. These data are contrasted with some recent experiments in hospitals where problems are encountered in evacuating handicapped patients within an acceptable time. The conclusions are that it is possible to predict evacuation time with a reasonable degree of accuracy, at least in comparison with data on fire drills in tall buildings. The costs of evacuation are dominated by the loss of rentable floor space, amounting to about 1 per cent of the floor space, and hence the rentable value of the building. In hospitals the time for evacuating patients confined to bed is very long and would raise serious problems in evacuating, for example, geriatric wards, particularly at nighttime when the staff is small. This suggests the possibility of evaluating the benefits of early detection and staff firefighting as an alternative to evacuation – an area where further research is required. 4 figs, 4 tables, 9 refs. (Author)

h. TACTICS

1842. Karataev AK and Rodimova NA
FOAM EXTINGUISHES FIRE BEHIND A CONCRETE MINE WALL
Bezop tr prom-sti; (5):26-27, 1976 (Russian)

It is shown that fires behind the concrete walls of shafts, slopes, planes and footways in them, breasts, and storage areas near shafts should be extinguished by mechanical foam, an economically advantageous and safe practice. The foam must be applied behind the wall from a distance. To extinguish burning materials behind a concrete wall, medium-expansion foam obtained from an ejection-type foam generator should be used. These generators are driven by the thrust energy of the foam-making mixture forced through the pipes by mine-drainage or fire pumps. 2 figs. (RZh)

1843. Anon
METHODS OF APPLYING FOAM FOR THE PROTECTION OF FLAMMABLE LIQUID BULK STORAGE
Fire Prot Rev; 40(434):32-33, 1977

Various methods of applying foam for the protection of flammable liquid bulk storage tanks are assessed, such as fixed or mobile foam chutes, master-stream nozzles, monitors, playpipes, etc, semi-surface or base injection equipment. Base-injection of fluoroprotein foams is singled out for special attention. Containment of liquefied gas storage leaks must be followed by measures to prevent the liquid and its vapors from spreading, one method being the floating of a foam raft over the surface of the liquid in the bund. Other aspects of liquid fuel containment, foam application techniques, bund protection, weather effects, and others are reported.

This article is a report on a paper presented by NHM Anderson (Angus Fire Armour) at the FPA (UK) Conference at Harrogate in October, 1976.

1844. Bezrukov V
THE SCIENCE OF FIGHTING GUSHERS
Neftyanik; (5):41-42, 1976 (Russian)

The experience gained in fighting oil-well fires at the Nizhnevartovsk (USSR) testing and training grounds is described. The overall problems involved in extinguishing fires in clusters of wells (variable in number) are examined. The necessity of continued installation of deep shutoff valves in clusters of oil wells is emphasized, since then all the wells in a cluster can be automatically shut off in case of an accident or fire in one of them. 8 figs. (RZh)

1845. Elias S and Bachmann F
PARTICULAR FEATURES OF FIRE DEPARTMENT OPERATIONS IN ELECTRICAL SYSTEMS
Unser Brandschutz; 26(8):30-32, 1976; 26(9):30-32, 1976 (German)

General measures regulating behavior and special steps to be taken during and after fighting fires in electrical installations are set forth in TGL 200-0619, page 2, entitled

8. FIRE OPERATIONS: PREVENTION AND SUPPRESSION

h. Tactics—Continued

"Operating Electrical Systems, Preventive Fire Protection and Fire Fighting." This article is intended to provide information on the physiological response of the human body when subjected to a flow of current, the hazards involved in approaching dangling power lines, and the situation that prevails when current is shunted over the stream of extinguishants. The current which passes over a solid stream through the human body is grounded, whereas a spray forms an electrical current such that it can be conceived of as a dielectric between the electrical portion of the system and the nozzle man. High-voltage line systems and minimum distances from them are evaluated quantitatively. 5 figs, 4 tables, 7 refs. (Fachdok 12/1094)

1846. Kukuczka A
SUPPRESSION OF UNDERGROUND FIRES BY REVERSING THE NEUTRALIZED FIRE GASES TRAPPED IN ELASTIC CONTAINERS
Wiad Gorn; 27(4):104-107, 1976 (Polish)

The method consists in attaching large elastic containers made, eg, of rubberized fabric, to barriers blocking off the fire section. On the exposed side of the barriers the depressurizing container should be filled with an inert gas (CO_2, N_2), on the unexposed side it should be empty. By depressurizing the fire section, the first container is emptied and the inert gas fills the isolation space; the second container is filled with fire gases of reduced O_2 content. Then the direction of the ventilating flow in the fire section is reversed by any of the known methods so that the exposed side of the barrier becomes the distributor side and vice versa. The exposed side then fills again with gases from beyond the barrier and the other side is emptied. This process is repeated until the O_2 content in the atmosphere of the fire section is reduced to the level at which combustion ceases. This method has been tested in practice in the Boze Dosy (Poland) mine to extinguish a fire that broke out in seam 318. According to calculations, the volume of the voids in the isolated fire section was 10,000 m^3. The composition of the gases on the unexposed side was close to that of atmospheric air, while on the exposed side the composition was 4.7% O_2, 5.7% CO_2, 1.7% CH_4, and 1.2% H_2. The air flow in the fire section was reversed by regulating the ventilation locks on the slope. Elastic containers of 50 m^3 capacity were attached to the barriers; one was filled with CO_2. Depressurization in the fire section was regulated in such a way that the emptying of one container and filling of the other took 10 minutes. In 5 days the O_2 content in the fire gases issuing alternately from the two containers was reduced to about 1%, which was enough to fully quench the combustion processes, while in 10 days the temperature in the fire section was reduced to limits that precluded the hazard of resumption of combustion. It is emphasized that this method is simple in application and does not require special devices. 4 figs, 2 refs. (RZh)

1847. Plotkin M and Surikova A
IGNITION PROTECTION OF GAS BLOWOUTS
Pozhar delo; (8):24-25, 1976 (Russian)

The author describes gas blowout tests using an experimental borehole. It was found that a gas flow of 4,000,000 m^3 per day can be protected against ignition with an AGVT-100 fire apparatus (water-augmented jet exhaust) using at least 3 hoses with gas/water jets (about 60 o/sec at 12,000 rpm), which wet down the gas flow at a point about 3-3.5 m above the mouth of the borehole. Details concerning the experimental borehole, the quantity of gas, extinguishants, extinguishing methods, etc are given in the article. 1 fig. (Fachdok 13/0259)

1848. Dixon PM and Richards RC
EXTINGUISHMENT OF ENGINE COMPARTMENT FIRES IN RECREATIONAL BOATS. Coast Guard Res and Dev Center, Groton, CT; CGRDC-1-76, USCG D-31-76, 34 pages, Jan 1976
Availability: NTIS AD-A031 307/2GA

This report documents the evaluation of the Port Method of extinguishing engine compartment fires in recreational boats. In this method, the operator directs the extinguisher discharge into the engine compartment through a normally closed, but easily opened, port. The tests were conducted in full scale mockups of the aft sections of inboard/outdrive box type, inboard/outdrive across-the-stern, and the inboard flush hatch engine compartment configurations. Benefits of this method include confinement of heat and flame to the engine compartment, the limitation of oxygen to the fire, and greater effectiveness from handheld fire extinguishers. (Author)

1849. Hemstreet RA
SURVEY OF SUPPRESSION OF SODIUM FIRES IN LIQUID METAL FAST BREEDER REACTORS. Factory Mutual Res Corp, Norwood, MA; ERDA 76-70, 18 pages, Jun 1976
Availability: NTIS

A survey was made of protection and suppression technologies relative to liquid sodium fires at selected sites. These technologies will find application in the Liquid Metal Fast Breeder Reactor (LMFBR) program. Based on this survey, a series of conclusions and recommendations are given. Dry type powder agents will be of use only in relatively small sodium fires. Large fires will be extinguished by inerting the chamber or collecting pans where the sodium leak occurs. Liquid sodium fire suppression methods must be incorporated into the initial design of an LMFBR. There exists a need for close coordination of liquid sodium fire technology and guidelines for firefighting personnel. Suggestions are made for a number of technical development programs. An extensive search for new suppression agents is not recommended, although carbon microspheres should be submitted for approval. (Author)

9. PLANNING

a. BUDGETING

1850. Ulrich RL
FIRE DEPARTMENT BUDGETING IN A TIGHT COMMUNITY
Fire Chief; 20(10):41-42, 1976

Some tips on effective fire department budgeting in terms of "accountability" are offered by the former Fire Chief of the DeKalb, Illinois, fire department. Reference works to be used as guidelines in budget preparation are cited.

1851. Mahoney EF
REDUCING THE RISING COST OF FIRE PROTECTION
Fire Chief; 21(1):68, 70, 72, 1977

The objective of this article is to provide those responsible for fire-department operations with some thoughts for reducing the rising cost of fire protection while maintaining or increasing the level of service. Of primary consideration in the evaluation of methods of reducing costs are the two factors of 1) reduction in manpower or 2) absorption of duties performed by other city employees by fire department personnel.

b. LOGISTICS

1852. Utterbeck JS
A MODEL FOR PREDICTING EMERGENCY VEHICLE RESPONSE TIME. Darcom Internat Training Center; DARCOM ITC-02-08-76-110, 54 pages, 1976
Availability: NTIS AD-A028 233/5GA

This paper reports the development of a predictive response time model for the fire equipment using response time data from the Texarkana, Texas Fire Department. This predictive model resulted in a coefficient of multiple regression (R2) of 0.6485; it is significant at the 0.0001 level. The model was developed from response time data in the range of 60 to 480 seconds and distances up to 15000 feet. For validation purposes the model was used to estimate selected times from various station locations. These same routes were then physically run in a 1973 Ward LaFrance 1250 gpm diesel pumper. The estimated run times were compared to the measured run times using a hypothesis test for equality of means. The model is found to be a valid predictor of response times at the 0.01 level of significance. (Author)

1853. Ignall EJ, Kolesar P and Walker WE
USING SIMULATION TO DEVELOP AND VALIDATE ANALYTICAL EMERGENCY SERVICE DEPLOYMENT MODELS. Rand Corp, Santa Monica, CA; P-5463, 45 pages, Aug 1975
Availability: NTIS AD-A032 099/4GA

Simulation models are generally costly tools to use in systems analyses. Whenever applicable, a simple analytic model is preferable. However, in many cases, the conditions assumed by solvable analytic models do not hold in the real world. But a simulation can be used to suggest an approximate model and to determine how good an approximation an analytic model is. Simulations of New York City's fire and police operations were used to develop and validate simple analytic models that are now being used to analyze the deployment of resources in these two services. (Author)

c. OPERATIONS ANALYSIS

1854. Minaev SN (Ed)
PROBLEMS OF ECONOMICS IN FIRE PROTECTION
[Voprosy Ekonomiki v Pozharnoy Okhrane]
VNII protivopozharnoy oborony, Moscow, USSR; 128 pages, 1975 (Russian)

Considered in this fourth issue of a series being published by the All-Union Fire Protection Research Institute (Moscow, USSR) are the problems involved in organizing fire prevention operations in commerce and industry, evaluating the activities of the fire service, and validating the number of fire-service personnel in the various categories. The results of a statistical analysis of fire casualties are discussed. Technical and economic factors of water-supply systems for fire fighting are assessed, as are methods of thermal protection of equipment and principles of evaluating the cost-effectiveness of automatic fire-warning devices. Aspects of application of mathematical methods to solve the problems of evaluating the fire hazard of enterprises of the national economy, of determining the concept "operational status," of handling simultaneous responses by fire-fighting units, and of allocation of units are examined. The collection of papers (15) is intended for fire service employees, instructors and students of the fire-engineering institutes, and personnel of scientific establishments and industrial enterprises. (Author)

1855. Thrasher CL
SIMULATION — A NEW TOOL FOR THE FIRE SERVICE
Fire Chief; 21(1):55-57, 1977

The author exposes a theory of human behavior, namely, change in technology, attitudes, and awareness, and suggests that simulation of situations in the future is a valuable tool for dealing with change by gaining insight into innovative procedures and tools. A concerted effort to establish a base of system component models to deal with fire incidence, resources distribution and allocation, fire service management in general, and the command and control elements of suppression is urged.

1856. Lynch E and Rehr R
GUIDELINES TO HELP YOU DEVELOP A MASTER PLAN
Fire Eng; 129(10):26-30, 1976

The rationale for the preparation of a fire service master plan is the need to better utilize existing resources and fully justify additional resources to achieve fire safety goals. Fire guidelines for master planning are advanced: 1) the plan should be practical and achievable; 2) costs and benefits of proposals should be clearly defined, offering alternative courses of action; 3) it must identify strategies, calculate necessary resources, and identify short- and long-term actions; 4) people outside the service must participate in the process; and 5) it should be used as a public relations instrument. Eight steps in the planning approach are discussed. 3 figs, 2 refs.

1857. Zuccarelli LA
REALISTIC PLANNING NEEDED TO JUSTIFY GOALS
Fire Eng; 129(11):116-118, 1976

The fire service has entered a period in which there is a need for definite accountability. Effective utilization of a fire department's total resources, reducing costs, improving resource management, developing and applying innovative methods, and proving the need for continual and increasing community support are important elements in maintaining organizational viability. These aims can be met only by planning, the establishment of realistic goals and objectives. The author presents several sample goals to provide insight into the ways these goals and objectives can be met.

10. HUMAN BEHAVIOR, SOCIAL, AND MEDICAL PROBLEMS

[For more complete coverage of the behavioral and medical literature see: ***Psychological Abstracts*** and ***Index Medicus***.]

a. ARSON

1858. Maguire HM
A PROGRESSIVE, INNOVATIVE, AND SUCCESSFUL PROGRAM TO REDUCE ARSON
Fire Command; 43(11):25-27, 1976

The success achieved in one year's experience with Seattle's eight-agency arson-fighting effort is illustrated statistically. Some of the more important factors involved in this anti-arson effort, such as the fire investigator's training program, police involvement, utilization of combat firefighters, insurance industry support, school assistance, and public relations, are discussed. 2 photos, 1 table.

1859. Sylvia RP
BATTLE PLAN FOR WAR AGAINST ARSON DETAILED IN REPORT TO FIRE ACADEMY
Fire Eng; 129(12):42, 43, 1976

Recommendations for waging a war on arson, ranging from defining who will fight the battles to the development of a glossary of arson terms, has recently been published by the National Fire Academy. Some of the topics discussed are: basic training in arson detection and fire-cause identification; arson squad concept; model program levels; insurance personnel training; laws to cut arson profits; arson detection equipment; sources of funding; and publicity. The recommendations were developed by 36 persons who met under the auspices of the Academy in January and February, 1976. The conferees represented not only the fire service, but also such varied interests as the insurance industry, the prosecuters, and even bankers. Their purpose was to define specific areas in which definite actions can be taken to ameliorate the incidence of arson. (Author)

1860. Anon
ARSON — SOME COMMON SENSE SOLUTIONS
J Am Ins; 52(4):11-15, 1976

On the basis of arson statistics and several case histories of arson, a few practical suggestions for reducing the incidence of arson are advanced.

1861. Anon
MONEY IS OFTEN THE MOTIVE FOR ARSON!
Office; (3):26,52,57, 1976

Discussed in general terms is the profit motive in the crime of arson, the security steps being taken by business, and the necessity of reclassifying arson as a so-called Part I crime, a higher priority that would result in shifting more money to the prevention, detection and prosecution of arson.

b. COMBUSTION TOXICOLOGY

1862. Petroff PA, Hander EW, Clayton WH and Pruitt BA, Jr
PULMONARY FUNCTION STUDIES AFTER SMOKE INHALATION
Am J Surg; 132(3):346-351, 1976

Inhalation injury occurring during a fire remains a serious problem. The diagnosis has been made simpler by the use of xenon 133 scintiphotography, in which xenon 133 is injected into a vein and the lungs scanned, noting the length of time it takes for the xenon 133 to "wash out." Bronchoscopy has also been of assistance in making the diagnosis and is especially important in diagnosing impending acute airway obstruction from laryngeal edema. But neither of these methods can help in estimating the functional severity of the injury. For this, pulmonary function testing may be of value. This report demonstrates that changes in the maximum expiratory flow volume curve and in pulmonary resistance correlate well with the xenon 133 scan and can be useful in evaluating smoke inhalation, determining the severity of injury, and monitoring the therapy. 3 figs, 3 tables, 11 refs. (Author)

1863. Levy AL, Lum B and Abeles FJ
CARBON MONOXIDE IN FIREMEN BEFORE AND AFTER EXPOSURE TO SMOKE
Ann Clin Lab Sci; 6(5):455-458, 1976

A statistically significant difference was found between the mean baseline carboxyhemoglobin of non-smoking firemen (COHb 2.53, $sd=1.05$, $n=35$) and smoking firemen (COHb 5.54, $sd=2.61$, $n=26$). A consistent increase in mean COHb levels after exposure to smoke was seen in both non-smoking (4.41, $sd=2.95$, $n=7$) and smoking men (8.75, $sd=5.66$, $n=11$), but the mean increase in these two groups was statistically significant only at the 90 percent level ($t=1.85$, $df=16$, $p<0.1$). 1 table, 11 refs. (Author)

1864. Pietak SP and Delahaye DJ
AIRWAY OBSTRUCTION FOLLOWING SMOKE INHALATION
Can Med Assoc J; 115(4):329-331, 1976 (English; French Summary)

Respiratory distress with episodes of cyanosis, intercostal retraction and sibilant rhonci occurred in a 2-year-old boy over a 48-hour period following serious smoke inhalation. Worsening of the child's condition accompanied these findings, culminating in sudden loss of air entry, severe respiratory distress and loss of consciousness, which necessitated endotracheal intubation for resuscitation. Pronounced improvement followed removal of two pseudomembranous casts from the airway by suctioning, and thereafter recovery was uneventful. 3 figs, 9 refs. (Author)

1865. Voronin VA, Denisenko AA and Linyucheva LA
STUDY OF THE COMBINED EFFECT OF CYANIDE, HYDROGEN BROMIDE AND FREON 114 BF
Gig Sanit; (1):105-106, 1976 (Russian)

The possibility that there may exist a combination of Freon 114 B_2, hydrogen bromide and cyanide in the atmosphere is governed by the pyrolytic decomposition of the Freon used as a fire extinguishant. In cases of rapidly developing, massive contamination of the atmosphere by the pyrolysis products of Freon during fires, humans may be prevented from entering burning areas. For this reason it was considered to be useful to study the nature of the combined effect of the above-mentioned compounds. The results of a toxicological study of this combination revealed a potential toxic effect. The combination of cyanides and hydrogen bromide has an opposite toxic nature, and it can therefore be assumed that the total effect will be additive. 1 fig, 1 table, 4 refs. (Author)

1866. Winter PM and Miller JN
CARBON MONOXIDE POISONING
J Am Med Assoc; 236(13):1502-1504, 1976

Carbon monoxide poisoning is a relatively common medical emergency, causing injury and death in accidents, suicide attempts, and fires. Undetectable without instruments, the gas is lethal at small fractions of a percent of 1 atm (a). Its effect is disruption of the O_2 transport chain by replacement of O_2 on the hemoglobin molecule and by shifting of the carboxyhemoglobin dissociation curve to the left. All COHb concentrations above 20% produce symptoms of cerebral or myocardial hypoxia. Rapid initiation of definitive therapy is critical. One hundred percent O_2 at atmospheric or hyperbaric pressures should be administered to reverse hypoxia and accelerated elimination of CO. Ancillary therapy for cerebral edema may be necessary if hypoxia is severe. 2 figs, 1 table, 11 refs. (Author)

1867. Fiserova-Bergerova V
MATHEMATICAL MODEL OF INHALATION EXPOSURE
J Combust Toxicol; 3(3):201-210, 1976

In the mathematical model, uptake, distribution and excretion are described by mathematic functions, in which the rate constants are determined by tissue volumes, blood profusion, and by the solubility of vapors (partition coefficients). Tissues are grouped into four pharmacokinetic compartments: alveolar air (rapid gas exchange group); well profused tissues (vessel rich group); muscles and skin (muscle group); and adipose tissues and fatty marrow (fat group). Continuous and interrupted chronic exposures are studied. 5 figs, 2 tables, 9 refs. (Author)

1868. Hilado CJ, LaBossiere LA, Leon HA, Kourtides DA, Parker JA and Hsu MS
THE SENSITIVITY OF RELATIVE TOXICITY RANKINGS BY THE USF/NASA TEST METHOD TO SOME TEST VARIABLES
J Combust Toxicol; 3(3):211-236, 1976

Pyrolysis temperature and the distance between the source and sensor of effluents are two important variables in tests for relative toxicity. Many materials, particularly the more thermally stable synthetic polymers, exhibit significant differences in response between temperatures of 500 and 800°C, and the distance between the sample being pyrolyzed and the test animal often represents a compromise between adequate cooling of the pyrolysis effluents and access to toxicants. Modifications of the USF/NASA (Univ San Francisco/Nat Aeron and Space Admin) toxicity screening test method to increase the upper temperature limit of pyrolysis, reduce the distance between the sample and the test animals, and increase the chamber volume available for animal occupancy, did not significantly alter rankings of relative toxicity of four representative materials. The changes rendered some differences no longer significant, but did not reverse any rankings. The materials studied were cotton, wool, aromatic polyamide, and polybenzimidazole. 3 figs, 11 tables, 13 refs. (Author)

1869. Hilado CJ and Miller CM
THE EFFECT OF CHANGES IN THE USF/NASA TOXICITY SCREENING TEST METHOD ON DATA FROM SOME CELLULAR POLYMERS
J Combust Toxicol; 3(3):237-258, 1976

Rankings of relative toxicity can be markedly affected by changes in test variables. Revision of the USF/NASA (Univ San Francisco/Nat Aeron and Space Admin) toxicity screening test procedure to eliminate the connecting tube and supporting floor and incorporate a 1.0 g sample weight, 200°C starting temperature, and 800°C upper limit temperature for pyrolysis, reversed the rankings of flexible polyurethane and polychloroprene foams, not only in relation to each other, but also in relation to cotton and red oak. Much of the change is attributed to reduction of the distance between the sample and the test animals, and reduction of the sample weight charged. Elimination of the connecting tube increased the relative toxicity of the polyurethane foams. The materials tested were flexible polyurethane foam, without and with fire retardant; rigid polyurethane foam with fire retardant; flexible polychloroprene foam; cotton, Douglas fir, red oak, hemlock, hardboard, particle board, polystyrene, and polymethyl methacrylate. 1 fig, 11 tables, 17 refs. (Author)

1870. Hilado CJ, Saxton GL, Kourtides DA, Parker JA and Gilwee WJ, Jr
RELATIVE TOXICITY OF PYROLYSIS PRODUCTS OF SOME CELLULAR POLYMERS
J Combust Toxicol; 3(3):259-269, 1976

Twelve samples of cellular polymers were evaluated in the course of developing test methods for toxic materials characterization. Six samples were flexible polyurethane foams, three were rigid polyurethane foams, two were high-density rigid foams, and one was a modified polyimide foam. Some effects of formulation variables are discussed. 1 fig, 2 tables, 8 refs. (Author)

1871. Hilado CJ, Slattengren CL, Furst A, Kourtides DA and Parker JA
RELATIVE TOXICITY OF PYROLYSIS PRODUCTS OF SOME SYNTHETIC POLYMERS
J Combust Toxicol; 3(3):270-283, 1976

Nineteen samples of synthetic polymers were evaluated for relative toxicity in the course of characterizing materials intended for aircraft interior applications. The generic polymers included ABS, chlorinated PVC, polycarbonate, polyphenylene oxide, polyphenylene sulfide, polysulfone, polyaryl sulfone, polyether sulfone, polybismaleimide, and polyvinyl fluoride. Test results are presented and compared in relative rankings with similar results on cellulosic materials and other synthetic polymers. Under these test conditions, the samples of synthetic polymers were either comparable to or significantly less toxic than the samples of commercial cellulosic materials. 3 figs, 3 tables, 8 refs. (Author)

1872. Hilado CJ, Smouse KY and Leon HA
A LARGE HEMISPHERICAL CHAMBER FOR FIRE TOXICITY TESTS
J Combust Toxicol; 3(3):284-295, 1976

Small-scale laboratory tests for relative toxicity of pyrolysis and combustion products are limited as to the size and number of animals that can be exposed in each experiment. As a result, several tests are needed on each material to adequately discriminate between materials. An 84-liter hemispherical chamber for fire toxicity tests is described in this paper. It is designed to expose 36 mice, eight rats, four rabbits, or combinations of smaller numbers of two or three species simultaneously to the gaseous products of pyrolysis or combustion. Some test results are presented. The 84-liter chamber does not appear appropriate for screening purposes because its large size introduces operating costs and problems which reduce its cost-effectiveness. It appears to be significantly different in that the concentrations required to obtain mortality were significantly higher than were needed in the 4.2-liter chamber. It is useful for producing large numbers of exposed animals for physiological studies. 2 figs, 2 tables, 14 refs. (Author)

1873. Keller JG, Herrera WR and Johnston BE
AN INVESTIGATION OF POTENTIAL INHALATION TOXICITY OF SMOKE FROM RIGID POLYURETHANE FOAMS AND POLYESTER FABRICS CONTAINING ANTIBLAZE (Reg)19 FLAME RETARDANT ADDITIVE
J Combust Toxicol; 3(3):296-304, 1976

Previous reports of abnormal neurological effects and increased toxicity for the non-flaming decomposition products of certain trimethylolpropane-based rigid polyurethane foams containing flame retardant additives were confirmed. In similar experiments with rigid polyurethane foams and polyester fabric samples containing a cyclic phosphonate derivative of trimethylolpropane, these effects were not observed. An explanation based on the stability of the cyclic phosphonate flame retardant additive is proposed. 3 tables, 16 refs. (Author)

1874. Hilado CJ, Smouse KY, Kourtides DA and Parker JA
THE EFFECT OF TEMPERATURE AND AIR FLOW ON THE RELATIVE TOXICITY OF POLYMERIC MATERIALS BY THE USF/NASA TOXICITY SCREENING TEST METHOD
J Combust Toxicol; 3(3):305-336, 1976

A variety of polymeric materials was evaluated using the USF/NASA (Univ San Francisco/Nat Aeron and Space Admin) toxicity screening test method with two levels of pyrolysis temperature and two levels of air flow. The materials evaluated were polyethylene, polycaprolactam (nylon 6), polybismaleimide, polycarbonate, polyaryl sulfone, polyether sulfone, polyphenylene sulfide, chlorinated polyvinyl chloride, polychloroprene foam, Douglas fir, red oak, hemlock, and wool fabric. Relative toxicity was highly dependent on pyrolysis temperature, air flow, and choice of toxicity criteria. Under essentially smoldering conditions without air flow, relative toxicity appeared to be highly dependent on the weight pyrolyzed. Under oxidative pyrolysis conditions with relatively high air flow, relative toxicity appeared to be dependent on temperature, rate and time of pyrolysis. Relative toxicity rankings are highly dependent on selection of test conditions and criteria. It appears possible to select a ranking system which would be applicable over a range of fire situations, even though it would not cover all situations. The rankings obtained at 300°C without air flow seem to have the widest applicability. The polyether sulfone samples were consistently among the less toxic materials in this study. 2 figs, 17 tables, 17 refs. (Author)

1875. Hilado CJ, Marcussen WH, Furst A, Kourtides DA and Parker JA
APPARENT LETHAL CONCENTRATIONS OF PYROLYSIS PRODUCTS OF SOME POLYMERIC MATERIALS
J Combust Toxicol; 3(4):345-362, 1976

Thirty-nine samples of polymeric materials were evaluated to determine the apparent lethal concentrations of their pyrolysis products. The materials were compared on the basis of the apparent lethal concentration for 50 percent of the test animals (ALC^{50}). Relative toxicity rankings based on ALC^{50} values can differ significantly depending on whether they are based on weight of sample charged or weight of sample pyrolyzed. The ranking of polyphenylene sulfide is particularly sensitive to this difference. Relative toxicity rankings can differ significantly depending on whether they are based on ALC^{50} or Td values. The rankings of wool, ABS, and bisphenol A polycarbonate seem particularly sensitive to this difference. 3 figs, 5 tables, 16 refs. (Author)

1876. Tsuchiya Y and Sumi K
DETERMINATION OF HYDROGEN CYANIDE IN FIRE GASES
J Combust Toxicol; 3(4):363-370, 1976

Many of the nitrogen-containing polymers produce HCN when involved in fires. Various methods of HCN determination in fire gases are reviewed. The methods discussed are colorimetric tubes, specific ion electrode, wet chemical analysis and gas chromatography. Two common problems in HCN determination are concentration decrease by absorption and interfering reactions. Authors recommend that at least two different methods be employed in order to avoid errors caused by interference and absorption. 1 fig, 2 tables, 15 refs. (Author)

1877. Nunez LJ, Hung GW and Autian J
TOXICITY OF FABRIC COMBUSTION PRODUCTS
J Combust Toxicol; 3(4):371-380, 1976

The toxicity of combustion products of nine fabric samples burned with a flame is presented. An infrared burner consisting of a radiating ceramic grid and fueled with natural gas served as the source of ignition. Male Sprague-Dawley white rats were the experimental animals. Mortality data allow the samples to be ranked. Untreated samples prove to be the least toxic. Treatment with flame retardants increased the toxicity of combustion products when burned under the conditions described. Topping with trimethylolmelamine after treatment may alter the toxicity, but the effect is small compared to the increase in toxicity associated with the primary treatment. 5 figs, 2 tables, 5 refs. (Author)

1878. Hilado CJ, Solis AN and Marcussen WH

EFFECT OF TEMPERATURE AND HEATING RATE ON APPARENT LETHAL CONCENTRATIONS OF PYROLYSIS PRODUCTS

J Combust Toxicol; 3(4):381-392, 1976

The apparent lethal concentrations for 50 percent of the test animals (ALC^{50}) of the pyrolysis products from 12 polymeric materials were studied as a function of temperature and heating rate. The materials were polyethylene, nylon 6, ABS, polycarbonate, polyether sulfone, polyaryl sulfone, wool fabric, aromatic polyamide fabric, polychloroprene foam, polyvinyl fluoride film, Douglas fir, and red oak. The ALC^{50} values of most materials vary significantly with temperature and heating rate. The ALC^{50} values, based on weight of sample charged, appear to effectively integrate the thermophysical, thermochemical, and physiological responses from a known quantity of material under specified imposed conditions. The differences resulting from variations in temperature history appear compatible with increased decomposition to toxic effluents, destruction of previously formed toxicants, and other thermochemical phenomena. 2 figs, 3 tables, 12 refs. (Author)

1879. Schumacher RL and Breysse PA

COMBUSTION AND PYROLYSIS PRODUCTS FROM SYNTHETIC TEXTILES

J Combust Toxicol; 3(4):393-424, 1976

A thermal decomposition system and compatible analytical procedure was developed for the examination of 5 synthetic textiles commonly used in building furnishings. Pyrolysis was accomplished by two methods: self-sustained combustion in a 31.1 o stainless steel chamber, and thermal decomposition on an electrically heated metal foil in a 62 cc gas-tight pyrolysis cell. Thermal decomposition products were analyzed by infrared spectrophotometry, gas chromatography/mass spectrometry and by ion-specific electrode. 12 figs, 12 tables, 20 refs. (Author)

1880. Hilado CJ and Furst A

RELATING TOXICITY OF PYROLYSIS PRODUCTS OF SOME MATERIALS USED IN HOME FURNISHINGS

J Combust Toxicol; 3(4):425, 1976

Seventy samples of cushioning and upholstery materials used in home furnishings were evaluated for relative toxicity by means of the USF/NASA (Univ San Francisco/Nat Aeron and Space Admin) toxicity screening test. The materials were variably toxic under pyrolysis conditions, and this test appeared suitable for discriminating among them on the bases of time to incapacitation and time to death. The addition of fire retardants to these materials to comply with flammability regulations either had no significant effect on toxicity, or resulted in a reduction in relative toxicity. The modification of materials to comply with California upholstered furniture flammability regulations appears to have resulted in desirable limitations on toxicity. Fifty percent of the 70 materials tested caused incapacitation earlier than did the materials in compliance, and 30 percent caused death earlier. 2 figs, 9 tables, 31 refs. (Author)

1881. Bucci TJ, Hilado CJ and Lopez MT

A TECHNIQUE FOR EXTRACTING BLOOD SAMPLES FROM MICE IN FIRE TOXICITY TESTS

J Combust Toxicol; 3(4):465-470, 1976

The extraction of adequate blood samples from moribund and dead mice has been a problem because of the small quantity of blood in each animal and the short time available between the animals' death and coagulation of the blood. These difficulties are particularly critical in fire toxicity tests because removal of the test animals while observing proper safety precautions for personnel is time-consuming. Techniques for extracting blood samples from mice were evaluated, and a technique was developed to obtain up to 0.8 ml of blood from a single mouse after death. The technique involves rapid exposure and cutting of the posterior vena cava and accumulation of blood in the peritoneal space. Blood samples of 0.5 ml or more from individual mice have been consistently obtained as much as 16 minutes after apparent death. Results of carboxyhemoglobin analyses of blood appeared reproducible and consistent with carbon monoxide concentrations in the exposure chamber. 12 refs. (Author)

1882. Packham SC, Frens DB, McCandless JB, Petajan JH and Birky MM

A CHRONIC INTRA-ARTERIAL CANNULA AND RAPID MICROTECHNIQUE FOR CARBOXYHEMOGLOBIN DETERMINATION

J Combust Toxicol; 3(4):471-478, 1976

A procedure for chronic placement of a cannula in the femoral artery of the rat is described. A rapid spectrophotometric technique for COHb analysis is outlined. 1 fig, 1 table, 22 refs. (Author)

1883. Hilado CJ and Lopez MT

STUDIES WITH THE USF/NASA (Univ San Francisco/Nat Aeron and Space Admin) TOXICITY SCREENING TEST METHOD: EFFECT OF AIR FLOW AND EFFECT OF FABRIC DYE

J Combust Toxicol; 3(4):479-486, 1976

One sample each of commercial polyurethane and polychloroprene flexible foams were evaluated using the USF/NASA (Univ San Francisco/Nat Aeron and Space Admin) toxicity screening test method. Air flow rates of 0, 0.16, 16, and 48 ml/sec were used to determine the effect of air flow on relative toxicity. Time to first sign of incapacitation and time to death were substantially reduced with both polyurethane and polychloroprene flexible foams by the introduction of 16 to 48 ml/sec air flow. The relative toxicity rankings of these materials were not altered by changes in air flow. Under these test conditions, the polyurethane foam consistently appeared more toxic than the polychloroprene foam. Samples of six different colors from the same fabric were evaluated separately, using the USF/NASA toxicity screening test method, to determine the effect of fabric dye, if any. The material was an upholstery fabric, consisting of 46 percent cotton, 33 percent wool, and 21 percent nylon. There appeared to be no significant effect of fabric dye on relative toxicity for this material under these test conditions. 3 tables, 4 refs. (Author)

10. HUMAN BEHAVIOR, SOCIAL, AND MEDICAL PROBLEMS

b. Combustion Toxicology—Continued

1884. Hilado CJ
RELATIVE TOXICITY OF PRODUCTS OF PYROLYSIS AND COMBUSTION
J Consumer Prod Flammability; 3(3):193-217, 1976

Relative toxicity data are presented on a wide variety of polymeric materials, obtained using 14 different test methods, 11 based on pyrolysis and three based on flaming combustion. The test results are sensitive to variables such as exposure mode, temperature, air flow and dilution, concentration of material, and animal species, but relative toxicity rankings appear to be similar for many methods and materials. Temperature appears to be the most important variable. The natural materials, predominantly cellulosic, and the commodity polymers, such as polyethylene, seem generally more toxic at the lower temperatures (200 to 500°C) where many synthetic polymers are thermally stable. Some synthetic polymers do not exhibit significant toxicity until temperatures of 600 to 800°C are reached. The wide variation in materials and frequent reliance on mortality data alone render much of the assembled information unsuitable for direct comparisons. Times to incapacitation and to death provide a more suitable basis for relative toxicity rankings. The good correlation between the USF/NASA, FAA/CAMI, and FAA/NAFEC results for a limited number of materials indicates that variables such as chamber volume and animal species may not significantly alter relative toxicity rankings. 3 figs, 25 tables, 19 refs. (Author)

1885. Hilado CJ
RELATIVE TOXICITY OF PYROLYSIS PRODUCTS OF POLYMERIC MATERIALS USING VARIOUS TEST CONDITIONS AND RANKING SYSTEMS
J Consumer Prod Flammability; 3(4):288-297, 1976

Relative toxicity data are presented on a wide variety of polymeric materials, to illustrate the effect of test method and ranking system. Previously published rankings are expanded with recent data. Materials are compared on the basis of mortality, time of death (Td), apparent lethal concentration for 50 percent of the test animals (ALC^{50}), and toxic threat index (TTI). 4 tables, 8 refs. (Author)

1886. Radford EP and Levine MS
OCCUPATIONAL EXPOSURES TO CARBON MONOXIDE IN BALTIMORE FIREFIGHTERS
J Occup Med; 18(9):628-632, 1976

A total of 519 firefighters were investigated for routine exposure to carbon monoxide. The findings indicate that: 1) firefighters are routinely exposed to low levels of carbon monoxide and develop carboxyhemoglobin levels greater than controls; 2) this elevation occurs regardless of smoking habits; 3) neither the fire severity nor the length of exposure allow the firefighter to adequately predict the level of toxic exposure he is experiencing; 4) continuous use of self-contained compressed-air breathing apparatus offers adequate protection from exposure; 5) intermittent use of the self-contained compressed-air breathing apparatus does not offer any advantage over nonuse; and 6) medical monitoring can be a valuable tool for determining variations in individual exposures to toxic agents due to variability in use of personal protective equipment and in work practices. 10 figs, 13 refs. (Author)

1887. Hubmann M
CHLORINE — A HAZARDOUS GAS
Kriminalistik; 30(10):445-449, 1976 (German)

Given in the article is a comprehensive view of the chemical properties of chlorine and its compounds, as well as their diverse uses. At and beyond a concentration of about 0.3 g in 1 m^3 of air, chlorine has a fatal effect when inhaled over a certain period of time, a period which naturally decreases with increasing chlorine concentration. Aside from ready perception of the odor, there are numerous detection methods for free chlorine. First-aid and protective measures, safety measures in the case of systems, correct storage of chlorine and its compounds and the possibilities for disposing of chlorine are discussed. Such information should be acquired by everyone involved with chlorine in order to avoid accident risks. Nine cases of chlorine poisoning, attributable primarily to lack of knowledge, are reported. 1 fig, 7 refs. (Fachdok 13/0083)

1888. Hilado CJ, Furst A and Marcussen WH
THE USE OF THE NASA ANIMAL EXPOSURE CHAMBER IN FIRE TOXICITY TESTS
Proc West Pharmacol Soc; 19:397-400, 1976

There is a need for screening tests to compare the relative toxicity of the pyrolysis and combustion products from the wide variety of materials used in aircraft, buildings, consumer products, and other applications. The apparatus should be low in cost and investment; procedures for operation should be simple and understandable to the user with little specialized training, and the test results should be reproducible and reliable. The methods and results for the animal chamber designed and patented by NASA Ames Research Center are presented. 1 fig, 1 table, 2 refs. (Author)

1889. Einhorn IN, Grunnet ML, Petajan JH and Baldwin RC
THE PHYSIOLOGICAL AND TOXICOLOGICAL ASPECTS OF COMBUSTION
Fire Protection Seminar, Internat, 5th, Papers, Vol 3; 1976, Sep 22-24, Karlsruhe, FRG, pages 23-50
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

Normally one expects that flame contact is the major cause of injury and death during fires. Analysis of the factors involved in numerous fires has revealed that most deaths were not due to flame contact, but were a consequence of the production of carbon monoxide, nitrogen oxides, and other combustion products, such as aldehydes, ketones, low-molecular-weight alcohols, hydrogen cyanide, and other noxious species. The major emphasis within the scope of this paper relates to the physiological and toxicological aspects of smoke produced during the combustion of natural and synthetic materials. Special emphasis is directed toward a laboratory protocol that has been developed to determine the qualitative and quantitative analysis of smoke, factors pertaining to smoke development, and the evaluation of the animal's ability to escape from and survive a fire. This methodology incorporates both an assessment of animal behavior and a bioassay technique to classify the physiological status of the animal. Finally, a review is presented of the pathological changes common to humans involved in "real fires," as well as an analysis of the pathological changes observed in test animals following exposure to carbon monoxide and other combustion products resulting from the thermal decomposition of Douglas fir and polyvinyl chloride polymers. 8 figs, 5 tables, 50 refs. (Author)

c. EMERGENCY MEDICAL SERVICES AND FACILITIES

1890. Nailen RL
PORTABLE MONITOR/DEFIBRILLATOR — THE HEART OF TODAY'S EMS
Fire Eng; 129(11):22-26, 1976

An essential item in today's emergency medical service is the portable cardiac monitor/defibrillator. The author discusses the operating features of available monitors, the standards governing their design, the cost, the tests used to ensure their operation, and the future developments to be expected. A table of the agencies issuing monitoring equipment standards is included. 2 photos, 1 chart.

1891. Nailen RL
TYPES OF RESUSCITATORS AVAILABLE AND WHAT THEY ARE DESIGNED TO DO
Fire Eng; 129(11):47-48, 50, 1976

The three common types of portable resuscitators for emergency medical service use are discussed: the intermittent positive-pressure type (IDPB); the positive/negative pressure device; and the demand-valve type with a high flow override. Selection guidelines are based on medical staff advice and the manufacturer's reputation. Standards applying to resuscitation equipment need to be written. The performance standard developed by the National Conference on Cardiopulmonary Resuscitation (May 1973) is mentioned. Changes in function for the future are not expected. 1 fig, 4 photos.

1892. Graf HK and Schade D
INTERIOR NOISE MEASUREMENTS IN RESCUE VEHICLES (AMBULANCES)
VFDB Z; 25(4):136-140, 1976 (German)

The presently available draft for a revised version of German industrial standard DIN 75,080, Sect 1, introduces the "state-of-the-art" as a scale for determining the interior noise level. For this reason, measurements were made of the interior noise in rescue vehicles at the Motor Transport Institute of the Rhine-Westphalian Technical University of Aachen in order to determine the state-of-the-art for types of rescue vehicles presently on the market. The measurement results described here for eight rescue vehicles show that the interior noise levels of these vehicles are comparable in magnitude to those of passenger cars. On the basis of this result an evaluation scheme for the interior noise of rescue vehicles is proposed to conform to the VDI guideline 2574. 7 figs, 2 tables, 14 refs. (Fachdok 13/0104)

d. INJURIES AND FATALITIES

1893. Bowes PC
CASUALTIES ATTRIBUTED TO TOXIC GAS AND SMOKE AT FIRES: A SURVEY OF STATISTICS
Med Sci Law; 16(2):104-110, 1976

This note surveys the statistics of fire casualties classified as having been overcome by gas or smoke in the United Kingdom Fire Statistics for the years 1955-72 inclusive. For the period covered, the proportion of all annual casualties suffering from this source of injury (both fatally and non-fatally) has increased by a factor of about 3. Currently, about half the fatal casualties from all causes in fires per annum are overcome by gas or smoke. Possible reasons for this increase are discussed and, although the available statistics do not permit any causal relationships to be established, it is considered that major factors responsible are likely to have been an increase in the amounts and, perhaps, the irritancy of gas and smoke generated in fires, resulting in more persons being trapped. An examination of the proportion of casualties surviving exposure to smoke and fire gases shows no evidence of a significant change in the toxicity of fire gases. 2 figs, 3 tables, 9 refs. (Author)

1894. Crikelair GF, Agate F and Bowe A
GASOLINE AND FLAMMABLE AND NONFLAMMABLE CLOTHING STUDIES
Pediatrics; 58(4):585-594, 1976

Studies were conducted on mannequins using gasoline and flammable and nonflammable children's clothing. The results indicate that the flame-resistant standards currently required by law for children's sleepwear lead to much less severe burns. 6 figs, 6 tables, 12 refs. (Author)

e. PHYSIOLOGY

1895. Loke J, Farmer W, Virgulto J, Putman C, Matthay R and Bouhuys A
PULMONARY FUNCTION AND CARBOXYHEMOGLOBIN LEVELS IN FIRE FIGHTERS
Clin Res; 24(3):387A, 1976

To study the occupational effect of fire fighting on the lung, pulmonary function (PF) and carboxyhemoglobin levels (COHb) were measured in 51 firemen, aged 24-59 (average 37) with an average of 12 years of fire fighting. Twenty-one nonsmoking firemen (NSF) had a baseline forced vital capacity (FVC) of 4.97 ±0.18L (mean ±SE) (101.6% of predicted) and FEV, 3.78 ±0.15L/sec (99.2% of predicted). In 30 smoking firemen (SF), FVC was 5.05 ±0.13L (105.1% of predicted) and FEV, 3.79 ±0.10L/sec (100.2% of predicted). Seven of the 51 firemen had FEV/FVC x 100 of less than 70%; 5 of these were smokers. Maximum expiratory flow (MEF) volume curves breathing air, then 80% helium and 20% oxygen mixture (He) were done in 39 firemen. MEF at 50% of FVC was measured on air (MEF50) and on He (MEF50He). The response to breathing He at 50% of FVC was expressed as $\Delta He = MEF50He - MEF50/MEF50 \times 100$. ΔHe in NSF was 33.95 ±3.6% and in SF 25.58 ±2.3%. Of the 39 firemen, 6 were nonresponders (ΔHe %) of whom 3 were smokers and 2 had mild viral respiratory illness. Baseline COHb in SF (5.66 ±0.29%) was significantly different from NSF (2.15 ±0.06%), $p<0.001$. Immediately after a building fire, PF was repeated in 7 firemen and COHb in 11. There were no significant changes in FVC, FEV, MEF50 and ΔHe compared to baseline studies. However, there was a significent increase in COHb from 3.44 ±0.52% to 5.29 ±0.68% ($p<0.001$). It is concluded that in this group of firemen there was a significant increase in COHb after a fire, but it would appear that the PF abnormalities are not due to exposure to combustion products in fire fighting but rather to cigarette smoking or mild viral respiratory infection. (This abstract was submitted to the 33rd Annual National Meeting of the American Federation for Clinical Research, Atlantic City, NJ, May 1-2, 1976.) (Author)

f. PSYCHOLOGY

1896. Bertrand AL and McKenzie LS
THE HUMAN FACTOR IN HIGH FIRE RISK URBAN RESIDENTIAL AREAS: A PILOT STUDY IN NEW ORLEANS, LOUISIANA
Planning and Research Associates, Baton Rouge, LA; 62 pages, 1976

This pilot study was prepared for the National Fire Prevention and Control Administration. The approach taken was to evaluate the fire problem in a high-risk neighborhood in terms of human behavior. Official records show that the majority of residential fires in the study area are the result of human carelessness. The threat of human-caused fire can be reduced through properly designed and implemented programs, thus fulfilling a major objective set forth in *America Burning* by the National Commission on Fire Prevention and Control.

This research introduces some basic insights that must be incorporated into fire prevention education programs directed at high-risk populations. In order for a program to succeed, it must be adapted to the needs of the target population. For this reason, the program must address human factors that contribute to fire incidences.

A great deal of this project's success is due to the cooperation of the New Orleans Fire Dept. Valuable insight into the nature of the fire problem was gained from the experience and concern expressed by fire service personnel from the superintendant to individual firefighters. Cooperation between the fire service and research personnel is of primary importance in devising methods to reduce fire losses. 9 refs, 6 tables. (Author)

1897. Stahl FI
SOME PROSPECTS FOR SIMULATING HUMAN BEHAVIOR IN HIGHRISE BUILDING FIRES: A PILOT DEMONSTRATION
Environmental Design Research Assoc Conf, Annual, 7th, Proc; 1976, May, Vancouver, BC, Canada, pages 211-218
Sponsor: Environmental Design Research Association

The development of adequate fire safety provisions for buildings is seen to depend upon a valid formulation of a total building fire system, in which human-behavioral and physical phenomena interact. In an effort to comprehend and model such a system, predict human responses in building fires, and assess the usefulness of safety code provisions, a simulation-modeling methodology was evaluated for the case of highrise office buildings. The model investigated generates human movement decision-making behavior under conditions of stress and uncertainty, and is based on the probabilistic Markov process. The internal validity of the present model is examined, by (a) assessing the extent to which variance in the dependent variable (safe egress from the danger zone) is accounted for by predictor variables measured during actual simulation runs, and (b) determining whether the model is capable of distinguishing between diverse spatial designs. Simulation runs were conducted for two different office arrangements, and there were five replications for each arrangement. It was found that: (a) depending on the configuration of predictor variables, up to 88% of the variance in the criterion could be accounted for, and up to 93.3% of the actual results of simulation runs were predictable by knowledge of these predictors; and (b) the present model was incapable of distinguishing between "open-office" versus "compartmentized" designs on the basis of occupants' final egress status, time spent by occupants in threat-invaded zones, or time required by evacuees to reach safety zones. Implications of the findings, and areas for further investigation, are explored. 3 figs, 3 tables, 7 refs. (The proceedings of the Conference were published by Douden, Hutchinson and Ross, Stroudsburg, PA, under the title *The Behavioral Basis of Design*, Book 1, 1976.) (Author)

1898. Carmack BJ
HUMAN BEHAVIOR IN FIRES
J Fire Flammability; 7(4):559-565, 1976

This article focuses on human behavior in response to fire situations. The author raises certain questions regarding various aspects of human behavior in fires. Attention is given to a description of panic behavior and its frequency. Jumping, reentering burning buildings, and the role of familial ties are explored. Actual fires with resultant human behavior are cited. Some of the current findings and ideas about behavior in response to fire situations are presented. The content is based on both a review of the literature and interviews with firefighters in the field. Questions remain for which the author stresses the need for research. 19 refs. (Author)

1899. Kraft G
FIRESETTER'S MOTIVE: IRRITATION IN THE PIT OF HIS STOMACH
Kriminalistik; 30(11):502-506, 1976 (German)

Scraps of fabric pressed into bales of rags were the main items burned in a total of 6 fires in a cardboard factory (property damage of 3-1/2 million marks). About 50 employees were under suspicion because they belonged to the shift that was working in all the fires. A workman of this shift with no prior record of delinquency was found to be the culprit. He gave as motive indigestion brought on by sexual abstinence owing to the lying-in period of his wife. The perpetrator set the fires with matches, although the fires were observed to develop explosively in all cases. The inquiry of the criminal police is being wrapped up and insights are being gained from this case. 1 fig. (Fachdok 13/0240)

1900. Newton J
SUICIDE BY FIRE
Med Sci Law; 16(2):177-179, 1976

The case is reported of a young man working as an assistant librarian who had been in hospital for two months and managed to leave the hospital and set himself on fire by throwing kerosine over himself and setting it alight.

1901. Jihaime F, De
HUMAN RESPONSE
Rev Tech Feu; 17(154):19-20, 1976 (French)

Physically active, cool-headed men with a faultless memory are needed to handle certain types of hazardous work, including fire suppression. When the danger signal sounds, they must make the most rational decision in a specific situation. It is emphasized that persons involved in hazardous work must be tested psychologically. A number of tests carried out with various people and various types of danger signals, such as acoustic, visual, and aural, is described.

1902. Stevens RE
BEHAVIOR AND PROTECTION OF PEOPLE IN EMERGENCIES
Fire Protection Seminar, Internat, 5th, Papers, Vol 2; 1976, Sep 22-24, Karlsruhe, FRG, pages 13-21
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

If designers would give more consideration to the people who will occupy the buildings they design and to the activities of the people in the buildings, the results would be a more fire-safe design. The author lists the important characteristics of people that affect their behavior in fire emergencies and cites activities that, together with the characteristics of people, establish fundamental considerations for fire-safe design. Case studies that exemplify human behavior in fire emergencies are briefed and the application of those studies to code requirements is shown. The author concludes that more knowledge of human behavior is needed, as well as methods to modify behavior. He stresses that although not documented, many code requirements are based upon human behavior in fire emergencies. 9 refs. (Author)

1903. Breaux J, Canter DV and Sime J
PSYCHOLOGICAL ASPECTS OF BEHAVIOUR OF PEOPLE IN FIRE SITUATIONS
Fire Protection Seminar, Internat, 5th, Papers, Vol 2; 1976, Sep 22-24, Karlsruhe, FRG, pages 39-50
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

The following report has been put together with a dual purpose in mind. First, it represents an attempt to integrate part of what we already know about the behavior of people in fires. Second, it is hoped that, given a rudimentary model of our knowledge to date, we can better assess the implications of what we know and point to areas of potential interest. For the present purpose we propose to concentrate upon the part of our model that deals with the early stages of a fire and behavior in relation to it. 18 refs. (Author)

1904. Strother Smith NC
BEHAVIOUR OF PEOPLE IN FIRE SITUATIONS
Fire Protection Seminar, Internat, 5th, Papers, Vol 2; 1976, Sep 22-24, Karlsruhe, FRG, pages 51-69
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

For the average human being a fire situation is, fortunately, not an everyday occurrence, and therefore the majority do not give a great deal of thought to their course of action when faced with a fire. Human beings are unpredictable creatures when placed in stress situations and a fire for most people is a very real stress situation. The major features of a fire that will contribute to the stress will be smoke, heat, noise and smell. The stress will be intensified by a number of other factors such as the presence of close relatives, particularly children, and personal property. It is seen in this paper that personal involvement through relatives and possessions threatened by the fire will force people totally to ignore their own personal safety. The purpose of this paper is to show through the studies of fires the pattern of human behavior. The conclusion will probably be drawn that human behavior is totally unpredictable, but it must be borne in mind that the majority of fire reports are concerned only with situations where casualties have occurred, so that many fire situations where it is possible that the occupants threatened by the fire behaved rationally are not reported. A recent paper, published by the Building Research Establishment on behalf of the Fire Research Station, sets out possibilities for research into the behavior of people in fire situations. 5 refs. (Author)

1905. Marchant EW
SOME ASPECTS OF HUMAN BEHAVIOR AND ESCAPE ROUTE DESIGN
Fire Protection Seminar, Internat, 5th, Papers, Vol 2; 1976, Sep 22-24, Karlsruhe, FRG, pages 85-101
Sponsor: Vereinigung zur Foerderung des Deutschen Brandschutzes eV.

The behavioral response of individuals and groups of people to various stimuli is discussed and the importance of mobility is emphasized, especially problems of slow-moving and heterogeneous groups. An example of a large store is included. The concepts of effective number and time-block analysis are introduced as aids to escape-route design. 3 figs, 4 tables, 30 refs. (Author)

11. CODES, STANDARDS, SAFE HANDLING, IDENTIFICATION OF HAZARDS

a. CODES

1906. Savel'ev PS (Ed)
DIGEST OF INFORMATION ON FIRE PREVENTION
[Sbornik Materialov po Pozhardnoy Profilaktike]
Rossel'khozizdat, Moscow, USSR; 328 pages, 1975 (Russian)

The fire-safety standards and codes (USSR) for industrial plants are presented in this digest. The revised and supplemented standard fire-safety codes for industrial plants are published to replace the now abrogated standard codes approved by the Central Fire Protection Administration of the Ministry of Internal Affairs in 1954. The codes for light-industry plants are given without certain appendices that were published as independent materials in this digest. The book is intended for officials of the National Fire Inspectorate and the administrative staff of the fire units. (Author)

1907. Carey WB
THE PROBLEM OF PENETRATIONS IN FIRE-RESISTIVE CONSTRUCTION
Build Stand; 46(1):10-11, 1977

Discussed in this article are the code requirements for penetration of fire-resistive barriers and the traditional enforcement interpretation of the provisions. The code provisions and the practicalities of today's building construction are not compatible. Consequently, the building official endeavors to enforce literal compliance while permitting construction practices which defeat the intent of the code. The problem lies with inadequate code provisions; modifications are suggested. 1 ref.

1908. Vogel BM
STANDARDS REFERENCED IN SELECTED BUILDING CODES. Nat Bureau Standards, Inst Appl Technol, Washington, DC; NBSIR 76-1140, 447 pages, Oct 1976
Availability: NTIS PB-259 626/0GA

This publication provides a compilation of the standards that are referenced in the building codes promulgated by: 1) the three model building code organizations, ie, Building Officials and Code Administrators International, Inc (BOCA), International Conference of Building Officials (ICBO), and the Southern Building Code Congress International, Inc (SBCC); 2) the 20 states that have either mandatory or voluntary building codes; and 3) the 30 largest US cities. In addition to identifying each standard referenced in the above named codes, this publication lists the current date of the standard, its current title, the codes referencing it, the date of the code, the locations within the code where the standard is referenced, and the date of the standard referenced in the code. The publication is intended to provide a base for assisting the building community in updating, utilizing and maintaining the standards referenced in building codes.

b. HAZARDS IDENTIFICATION

1909. Porter WE, Hunt CL and Bolton NE
A SYSTEM FOR LABELING AND CONTROL OF TOXIC MATERIALS IN A LARGE RESEARCH FACILITY
Am Ind Hyg Assoc J; 38(1):51-56, 1977

For large industrial and research operations, maintaining reasonable control of all toxic materials used in their operations can be a formidable task. A system utilizing cards has been developed which serves a dual purpose, informing the user regarding hazards of a particular material and also facilitating appropriate workplace surveillance during its use. Selected data are printed on the card. The card contains a label which the user detaches and affixes to the container. This label classifies the material according to flammability, toxicity, reactivity and special properties on a 0 through 4 hazard rating system. 5 figs, 4 refs. (Author)

c. SAFE HANDLING OF HAZARDOUS MATERIALS

1910. Philipson LL and Schaeffer MS
HAZARDOUS MATERIALS SHIPMENT DATA IN RISK ANALYSIS
Reliability and Maintainability Symp, Annual, 1975, Proc; 1975, Jan 28-30, Washington, DC, pages 519-527
Sponsor: IEEE

Described in this paper is the Integrated Risk Analysis System being proposed to the Office of Hazardous Materials of the Hazardous Materials Board of the US Department of Transportation. The system uses (1) aggregation categories of commodities and containers that permit the use of class data for the estimation of risk parameters appreciable to specific hazardous materials transportation options, (2) error measures that describe the uncertainties inherent in using aggregated data, and (3) decision algorithms that establish necessity conditions for the uses of aggregated data. 3 figs, 3 refs. (Author)

d. STANDARDS

1911. Anon
BSI CO-ORDINATION WORK ON FIRE TEST POLICY
Fire; 69(859):397-398, 1977

The Coordinating Committee on Fire Tests (UK) was set up in 1974 to develop a policy on fire testing and terminology and to control presentation of fire testing methods in British Standards and references to those in product specifications. This article outlines the present state of thinking on the roles, limitations and sensible usage of fire tests and indicates the directions of future work on the problems involved by the British Standards Institute and others.

1912. Kleier H
PROBLEMS OF DESIGNING EQUIPMENT AND EXTINGUISHANTS BY NATIONAL AND INTERNATIONAL STANDARDIZATION
VFDB Z; 25(4):123-136, 1976 (German)

Progress in technology has made it necessary to revise the 1964 German industrial standard DIN 14,406, the technical aspects of which date back to 1958. The viewpoints to be taken into account in the revision are identified. The result of the reworking was the draft standard for DIN 14,406 of April, 1976; the effects on extinguisher production of this revision are discussed in this paper. The difficulties involved in a uniform European regulation stem from the at-present strongly divergent national safety-engineering requirements. The efforts of the ISO/TC 21 (fire protection) in subcommittees SC 2 (portable fire extinguishers) and SC 6 (fire extinguishants) are pointed out. (This paper was presented at the public sessions of the Technical and Scientific Committee of the 1976 annual professional meeting of the VFDB in Berlin.) (Fachdok 13/0150)

12. INSURANCE, ECONOMICS OF LOSS AND PREVENTION

a. INSURANCE

1913. Boes AJ
FIRE DETECTION AND FIRE INSURANCE
Polytech Tijdschr. Bouwkunde, Wegen en Waterbouw; 31(2):115-119, 1976 (Dutch)

The potential value of a fire-detection system is examined on the basis of eight considerations: the purpose of the system; the results of having a system; the factors affecting early warning; the insurance aspects of a system with respect to industrial risk; how the fire is reported;

the components of a system; the operating principles of the different alarms; and approval of systems by insurers. The influence of installation of fire detection systems on the size of the fire insurance premium to be paid is emphasized. 4 figs.

b. LOSSES

1914. Anon

THE FEDERAL SUPREME COURT (FRG) DECIDES THAT THE FIRE SERVICE MUST KEEP DAMAGE AT A MINIMUM — CONTROVERSY WITH INSURERS

Feuerwehrmann; 25(10):292, 1976 (German)

This brief communication draws attention to litigation between the city of Wuppertal and an insurance company. The fire department had righted an overturned oil truck using a crane truck. In doing so, a large quantity of heating oil ran out, so that large volumes of soil had to be dug out and the road surface had to be replaced. The insurer accused the fire department of gross negligence because the oil had not been pumped out first. The decision of the Supreme Court was that a community is liable for damages inflicted on a third party by fire services operations. The community is liable regardless of whether the injured party can be recompensed in some other way. (Fachdok 13/0036)

1915. Rogers FE

INVESTIGATION OF A TECHNIQUE FOR ESTIMATING THE PROBABILITY DISTRIBUTION OF FIRE LOSS BASED ON EXTREME VALUE THEORY. Fire Res Sta, Borehamwood, UK; Fire Res Note 1062, 47 pages, 3 figs, 17 tables, 12 refs, Dec 1976

The feasibility of applying a model based on the theory of extreme values to the problems of estimating the parameters of the distribution of overall fire loss and of estimating the annual total loss in fires is investigated. Results and a comprehensive discussion of the results are given for the textile industry for the years 1966-72. The treatment of the subject is of necessity highly mathematical and somewhat complex in nature, but further publications giving details of practical applications are in course of preparation. (Author)

c. RESTORATION

1916. Perkins CW

RECOMMISSIONING CONTAMINATED ELECTRONICS EQUIPMENT — CONTINGENCY PLANNING

Fire Prev; (116):25-28, 1976

Electronic equipment can withstand considerably more abuse, including rigorous cleaning, than is generally realized, and the fastest restoring techniques can make a major contribution to minimizing business interruption losses after a fire. Contingency planning requires recognition of the factors that contribute to the deterioration of electronics equipment to reduce the probability of damage occurring and to employ the best techniques and skills available to restore equipment and systems speedily. 3 photos. (Author)

d. RISK MANAGEMENT

1917. Anon

OPTIMIZATION IN FIRE PROTECTION

Cerberus Alarm; (70):1-5, 1976 (German)

In order to keep the means applied to fire protection within reasonable bounds and to get an optimum degree of risk reduction, a number of considerations have to be taken into account. The existing risks have to be determined methodically. The principle governing risk reduction is application of the right measures at the right place at the right time, not forgetting that a certain residual risk remains. The three sequences of steps in active fire protection, namely, identifying the hazards, sounding the alarm, and fighting the fire, have a qualitative and a quantitative component, that is, suitability of the chosen means and measures and the degree of effectiveness of the chosen means and measures. Correct matching of means minimizes the residual risk. 6 figs, 2 tables. (Fachdok 13/0216)

1918. Underdown GW

RISK MANAGEMENT AT HOSPITALS, HOTELS AND HOLIDAY FLATLETS

Fire; 69(860):456-457, 1977

On the basis of a statistical analysis of the fire risks encountered in a variety of public facilities, including hospital wards, hotels and vacation housing, and of the fire fatalities in hospital fires compared with private residential fires, as well as the substantial sums being spent to provide fire protection for hospital facilities compared with the negligible sums being spent to reduce residential fatalities, the author suggests that an over-reaction has set in with regard to hospital safety. It is suggested that up-dating of fire precaution measures in hospitals be held back until the life risk in the home has been brought down and until more money is available. In the meantime, fire instruction in hospitals must be maintained and made more effective. 2 tables.

1919. Wooliscroft MJ

THE HOSPITAL FIRE PROBLEM — TOWARDS A RATIONAL APPROACH

R Soc Health J; 96(4):181-185, 1976

The aim of the article is to apply the technique of "failure logic" or "fault tree" analysis to calculate the hospital fire risk and to ensure that money spent reducing this risk is cost-effective. The analysis is preceded by a compilation of hospital fire statistics for the United Kingdom from 1968-1973. 4 figs, 6 tables, 14 refs.

1920. Redzic D

ECONOMIC ANALYSIS OF OPTIMAL INVESTMENTS FOR THE IMPLEMENTATION OF FIRE-PROTECTION MEASURES

Sigurnost; 18(2):45-51, 1976 (Serbocroation)

A method of determining optimum investments for fire-protection equipment in various industrial plants is described. The necessity of allowing for reductions in insurance premiums for the protection measures taken is pointed out. The protective measures should not exceed a reasonable technical range, because they become too expensive otherwise. These considerations are illustrated in three diagrams. 3 figs. (Fachdok 13/0230)

1921. Fedor OH, Parsons WN and Coutinho J de S
RISK MANAGEMENT OF LIQUEFIED NATURAL GAS INSTALLATIONS
Reliability and Maintainability Symp, Annual, 1976, Proc; 1976, Jan 20-22, Las Vegas, NV, pages 245-250
Sponsor: IEEE

A Risk Management System (RMS) has been developed to monitor the design, construction, and operation of Liquefied Natural Gas (LNG) facilities in New York City. The RMS requires demonstration that the New York Fire Department safety regulations are complied with at key milestones before permits for the next program phase are issued. The RMS provides for systematic hazard identification, risk analysis and corrective actions to eliminate identified hazards or reduce them to an acceptable level, contingency planning and training of operating personnel, hazard accountability and project reviews. The RMS applied NASA experience with hazardous facilities to a civilian sector of the economy. 8 figs, 7 refs. (Author)

e. SALVAGE

13. STATISTICS

1922. Anon
FPA CASEBOOK OF SOME RECENT MAJOR FIRES
Fire Prev; (116):31-42, 1976

The FPA casebook contains a statistical compilation of major fire damage in the UK for June-July, 1976, and a list of notable non-UK fires for the same period. Ten major UK fires are described in terms of main features, description of premises, damage, cause of fire, and other factors. The casebook closes with brief descriptions of 6 other fires. Illustrations and diagrams accompany the case histories.

1923. Anon
FPA CASEBOOK OF SOME RECENT MAJOR FIRES
Fire Prev; (117):33-44, 1977

The FPA casebook contains a statistical compilation of major fire damage in the UK for August-September, 1976, and a brief description of some notable non-UK fires for the same period. Six major UK fires are discussed in terms of main features, including estimated damage, description of premises, cause of the fire, fire tactics, and a narrative of the fire. Eight other notable industrial fires are described. Illustrations and diagrams accompany the various incidents.

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EXPANSIONS OF JOURNAL ABBREVIATIONS

Accid Anal Prev ..... Accident Analysis and Prevention
Acta Univ Upsaliensis ... Acta Universitatis Upsaliensis [Transactions of Uppsala (Sweden) University]
Adv Fire Retard Text, Prog Fire Retard Ser ... Advances in Fire Retardant Textiles, Progress in Fire Retardancy Series
All Forstztg ... Allgemeine Forstzeitung [General Forestry Gazetteer]
Am Chem Soc, Div Org Coat Plast Chem, Prepr ... American Chemical Society, Division of Organic Coatings and Plastics Chemistry, Preprints
Am Ind Hyg Assoc J ... American Industrial Hygiene Association Journal
Am J Surg .... American Journal of Surgery
Amts- und Mitteilungsbl Bundesanst Materialpruef ... Amts- und Mitteilungsblatt der Bundesanstalt fuer Materialpruefung [Official Gazette and Communications of the Federal Bureau for Materials Testing]
Anesth Analg .... Anesthesia and Analgesia
Anesthesiol .... Anesthesiology
Ann Clin Lab Sci ... Annals of Clinical Laboratory Science
Ann Mines .... Annales des Mines [Mine Annals]
Ann Surg .... Annals of Surgery
Antincendio protez civ ... Antincendio e Protezione Civile [Fire and Public Protection]
Apave ... Revue technique du groupement des associations de proprietaires d'appareils a vapeur et electriques [Technical Review of the Group of Associations of Steam and Electrical Equipment Owners]
Appl Ergon .... Applied Ergonomics
Arch Mal Prof Med Trav Secur Soc ... Archives des Maladies Professionnelles, de Medecine du Travail et de Securite Sociale [Archives of Professional Diseases, Industrial Medicine and Public Safety]
Arch Ophthalmol .... Archives of Ophthalmology
Arch Surg .... Archives of Surgery
Arch Termodyn Spal ... Archiwum termodynamiki i spalania [Archives of Thermodynamics and Combustion]
Aromatikkusu .... Aromatikkusu [Aromatics]
ASCE Proc. J Struct Div ... American Society of Civil Engineers. Proceedings. Journal of the Structural Division
ASHRAE J ... American Society of Heating, Refrigerating and Air-Conditioning Engineers Journal
ASME Trans. Ser C. J Heat Transfer ... American Society of Mechanical Engineers. Transactions. Series C. Journal of Heat Transfer
ASME Trans. Ser H. J Eng Mater Technol ... American Society of Mechanical Engineers. Transactions. Series H. Journal of Engineering Materials and Technology
ASTM Standardization News ... American Society for Testing and Materials. Standardization News
Bauplanung Bautech ... Bauplanung & Bautechnik [Building Design & Building Engineering]
Bautechnik ..... Bautechnik [Construction Engineering]
BBC-Nachr ... Brown-Boveri und Compagnie-Nachrichten [Bulletin of the Brown-Boveri Company]
Beratende Ing ... Beratende Ingenieure [Consulting Engineers]
Berufsgenoss ... Berufsgenossenschaft [Employer's Liability Insurance]
Betonwerk ... Betonwerk + Fertigteil-Technick [Concrete Work + Finished Parts Engineering]
Beton Zhelezobeton ... Beon i Zhelezobeton [Concrete and Reinforced Concrete]
Bezop ekspluat elektromekh oborud v shakhtakh ... Bezopasnost ekspluatatsii elektromekhanicheskogo oborudovaniya v Shakhtakh [Safety of Operation of Electromechanical Equipment in Mines]
Bezop tr prom-sti ... Bezopasnost truda v promyshlennosti [Occupational Safety in Industry]
Boei Daigakko Rikogaku Kenkyu Hokoku ... Boei Daigakko Rikogaku Kenkyu Hokoku [Scientific and Engineering Reports of the Defense Academy of Japan]
Bor'ba gazom, pyl'yu i vybrosami v ugol'n shakhtakh ... Bor'ba s gazom, pyl'yu i vybrosami v ugol'nykh shakhtakh [Prevention of Gas, Dust and Discharges in Coal Mines]
Brandaus .... Brandaus [All Out]
Brandforsvar .... Brandforsvar [Fire Protection]
Brandforsvar, FoU-Brand ... Brandforsvar, FoU-Brand [Fire Protection, Research Bulletin]
Brandhilfe .... Brandhilfe [Fire Assistance]
Brandschutz .... Brandschutz [Fire Protection]
Brandvaern .... Brandvaern [Fire Protection]
Brandverhuetung .... Brandverhuetung [Fire Prevention]
Brandwacht .... Brandwacht [Firewatch]
Brauwelt .... Brauwelt [Brewing World]
Brit J Ind Med ... British Journal of Industrial Medicine
Brown Boveri Mitt ... Brown-Boveri Mitteilungen [Communications from the Brown-Boveri Company]
Build Serv Eng .... Building Services Engineers
Built Stand .... Building Standards
Bull Inf Sci Tech ... Bulletin d'Informations Scientifiques et Techniques, Commisariat a l'Energie Atomique [Scientific and Technical Information Bulletin. Atomic Energy Commission]
Bull mens Chambre Commerce ind Meurthe-et-Moselle ... Bulletin mensuel de la Chambre du Commerce Industriel de Meurthe-et-Moselle [Monthly Bulletin of the Industrial Chamber of Commerce of Meurthe-et-Moselle]
BVD/SPI Bull ... Brandverhuetungsdienst/Services de Protection Incendie Bulletin [Fire Prevention Service Bulletin]

Cah Cent Sci Tech Batim ... Cahiers du Centre Scientifique et Technique du Batiment [Communications of the Scientific and Technical Building Center]

Can J Civ Eng ... Canadian Journal of Civil Engineering

Can Med Assoc J ... Canadian Medical Association Journal

Cent Tech Bois. Bull Inf Tech ... Centre Technique du Bois. Bulletin d'Informations Techniques [Technical Center for Wood. Technical Information Bulletin]

Cerberus Alarm ... Cerberus Alarm

Chart Mech Eng ... Chartered Mechanical Engineer

Chem Eng ... Chemical Engineering

Chemik ... Chemik (Poland) [Chemist]

Chem-Ing-Tech ... Chemie-Ingenieur-Technik [Chemistry-Engineer-Technology]

Chem Tech ... Chemische Technik [Chemical Engineering]

Civ Eng ... Civil Engineering (New York)

Clin Res ... Clinical Research

Combust Flame ... Combustion and Flame

Combust Sci Technol ... Combustion Science and Technology

Concrete ... Concrete

Constr Specifier ... Construction Specifier

Consult Eng ... Consulting Engineer

Cour Norm ... Courrier de la Normalisation [Standardization Bulletin]

Denki gakkai zasshi ... Denki gakkai zasshi [Journal of the Institute of Electrical Engineers of Japan]

Denki kikansya ... Denki kikansya [Electrical Machinery]

Denryoku to tetsudo ... Denryoku to tetsudo [Electric Lighting and Facilities in Railways]

Densetsu kogyo ...Densetsu kogyo [Electrical Construction Engineering]

Diesel Gas Turbine Progr ... Diesel and Gas Turbine Progress

Dimensions in Health Serv ... Dimensions in Health Service

Dimensions/NBS ... Dimensions/National Bureau of Standards

DIN Mitt ... Deutsche Industrie-Normen Mitteilungen [German Industrial Standards Bulletin]

Diteru ... Diteru [Detail: Magazine for Architects and Engineers]

Draegerheft ... Draegerheft [Draeger Bulletin]

Dtsch Ausschuss Stahlbeton ... Deutscher Ausschuss feur Stahlbeton [German Reinforced Concrete Committee]

Dtsch Farben Z ... Deutsche Farben-Zeitschrift [German Paint Journal]

Dtsch Mueller Z ... Deutsche Mueller-Zeitschrift [German Miller Journal]

Dupont Mag ... Dupont Magazine

Electr Commun ... Electrical Communication

Electr Contract ... Electrical Contractor

Electron Des ... Electronics Design

Electron Des News ... Electronics Design News

Electron Ind ... Electronics in Industry

Electron Power ... Electronics and Power

Elek-Prakt ... Elektro-Praktiker [Electrical Practitioner]

Elektro Anz ... Elecktro-Anzeiger [Journal of Electrical and Electronic Engineering]

Elektrotech Z ... Elektrotechnische Zeitschrift [Electrotechnical Journal]

Elektr Stn ... Elektricheskiye Stantsii [Electrical Power Stations]

Elettrotecn ... Elettrotecnica [Electrotechnology]

Eng Min J ... Engineering and Mining Journal

Environ Health Perspect ... Environmental Health Perspectives

Exchange ... Exchange

Face au Risque ... Face au Risque [Facing the Risk. Journal of the French National Prevention and Protection Center]

Feuerwehr ... Die Feuerwehr [The Fire Service]

Feuerwehrmann ... Feuerwehrmann [Firefighter]

Fire ... Fire

Fire Chief ... Fire Chief

Fire Command ... Fire Command

Fire Eng ... Fire Engineering

Fire Eng J ... Fire Engineers Journal

Fire Internat ... Fire International

Fire J ... Fire Journal

Fireline ... Fireline

Fire Mater ... Fire and Materials

Fire Prev ... Fire Prevention

Fire Prev Sci Technol ... Fire Prevention Science and Technology

Fire Prot Rev ... Fire Protection Review

Fire Technol ... Fire Technology

For Sci ... Forest Science

Fune no kagaku ... Fune no kagaku [Marine Engineering]

Gas Erdgas ... Gas- und Wasserfach, Gas-Erdgas [Gas and Water Technology, Gas—Natural Gas]

Geriatrics ... Geriatrics

Gig Sanit ... Gigiena i Sanitariya [Hygiene and Sanitation]

Glueckauf ... Glueckauf [Journal of Mining Engineering and Industry]

Glueckauf Forschungsh ... Gluechauf-Forschungshefte [Glueckauf Research Journal]

Gorno spasat delo ... Gorno-spasatel'noye delo [Mine Rescue]

Gornyi Zh ... Gornyi Zhurnal [Mining Journal]

Gummi Asbest Kunstst ... Gummi, Asbest und Kunststoffe [Rubber, Asbestos and Plastics]

Haikan gijitsu ... Haikan gijitsu [Piping Engineering]

Hansa ... Hansa [Journal of Shipping, Ship Construction and Harbors]

Heron ... Heron [Journal of the TNO for Building Materials and Building Structures, The Netherlands]

Hessische Feuerwehr Z ... Hessische Feuerwehr-Zeitschrift [Hessian Fire Service Journal]

HLH ... Zeitschrift fuer Heizung, Lueftung, Klimatechnik und Haustechnik [Journal of Heating, Ventilation, Air Conditioning and Household Engineering]

HLK ... Heizung-Lueftung-Klimatisation [Heating, Ventilating, Air Conditioning]

Holzrundschau .... Holzrundschau [Wood Review]
Hosp Top .... Hospital Topics
Hydrocarbon Process .... Hydrocarbon Processing
IEEE Proc ... Institute of Electrical and Electronics Engineers. Proceedings
IEEE Spectrum ... Institute of Electrical and Electronics Engineers. Spectrum
IEEE Trans Biomed Eng ... Institute of Electrical and Electronics Engineers. Transactions on Biomedical Engineering
IEEE Trans Power Appar Sys ... Institute of Electrical and Electronics Engineers. Transactions on Power Apparatus and Systems
Ind Digest .... Industrie Digest [Industrial Digest]
Ind Eng .... Industrial Engineering
Ind Eng Chem Prod Res Dev ... Industrial and Engineering Chemistry, Product Research and Development
Ind Miner Mine ... Industrie Minerale, Mine [Mineral Industry, Mines]
Ind Res .... Industrial Research
Ind Vernice ... Industria della Vernice [Varnish Industry]
Inf Constr ... Informes de la Construccion [Construction News]
Inf Process Manage ... Information Processing Management
Ing Digest ... Ingenieur Digest [Engineer's Digest/Materiels Nouveaux et Techniques Mondiales/Ingenieur Digest]
Inst Marine Engs, Trans ... Institute of Marine Engineers. Transactions
Instrum Control Syst ... Instruments and Control Systems
Instrum Technol .... Instrumentation Technology
Internat Fire Chief .... International Fire Chief
ISA Trans ... Instrument Society of America. Transactions
Instalador .... Instalador [Installers' Journal]
Izv Vyssh Uchebn Zaved, Gorn Zh ... Izvestiya Vysshikh Uchebnykh Zavedenii, Gornyi Zhurnal [Bulletin of the Institutions of Higher Education, Mining Journal]
J Am Concr Inst ... Journal of the American Concrete Institute
J Am Med Assoc ... Journal of the American Medical Association
J Br Fire Serv Assoc and Ind Fire Prot Assoc ... Journal of the British Fire Service Association and the Industrial Fire Protection Association
J Cell Plast .... Journal of Cellular Plastics
J Chem Educ .... Journal of Chemical Education
J Combust Toxicol ... Journal of Combustion Toxicology Quarterly Supplement to the Journal of Fire and Flammability)
J Consumer Prod Flammability ... Journal of Consumer Product Flammability (Quarterly Supplement to the Journal of Fire and Flammability)
J Faculty Eng, Univ Tokyo, Ser B ... Journal of the Faculty of Engineering, University of Tokyo, Series B [Tokyo Daigaku Kogakubu Kiyo, B (published in English)]
J Fire Flammability ... Journal of Fire and Flammability
J Fire Retard Chem ... Journal of Fire Retardant Chemistry (Quarterly Supplement to the Journal of Fire and Flammability)
J For .... Journal of Forestry
J Mines Met Fuels ... Journal of Mines, Metals and Fuels
J Mine Vent Soc S Africa ... Journal of the Mine Ventilation Society of South Africa
J Occup Med .... Journal of Occupational Medicine
J Pediatr .... Journal of Pediatrics
Jpn Railw Eng ... Japanese Railway Engineering (in English)
J Polym Sci: Polym Chem Ed ... Journal of Polymer Science: Polymer Chemistry Edition
J Polym Sci: Polym Lett Ed ... Journal of Polymer Science: Polymer Letters Edition
J Prestr Concr Inst ... Journal of the Prestressed Concrete Institute
J Psychiatr Nurs ... Journal of Psychiatric Nursing and Mental Health Service
J Soc Automot Eng Jap ... Journal of the Society of Automotive Engineers of Japan
J Text Inst .... Journal of the Textile Institute
Kasai ... Kasai [Journal of the Japanese Association of Fire Science and Engineering]
Keisoku jido seigyo gakkai ronbunshu ... Keisoku jido seigyo gakkai ronbunshu [Transactions of the Society of Instrument and Control Engineers]
Khim prom ... Khimicheskaya Promyshlennost [Chemical Industry]
Koatsu gasu ... Koatsu gasu/Journal of the Institute of Safety in High Pressure Gas Engineering (Japan)
Kogyo yosui .... Kogyo yosui [Industrial Water]
Kosoku doro to jidosha ... Kosoku doro to jikosha [Expressways and Automobile]
Kriminalistik .... Kriminalistik [Criminology]
Kuki tyowa to reito ... Kuki tyowa to reito [Air Conditioning and Refrigeration]
Kunstst .... Kunststoffe [Plastics]
Kunstst J .... Kunststoff-Journal [Plastics Journal]
Kunstst Plast .... Kunststoffe-Plastics
Lakokrasoch materialy i ikh primeneniye ... Lakokrasochnyye materialy i ikh primeneniye [Paints and Varnishes and Their Application]
Manage Sci .... Management Science
Maschinenmarkt ... Maschinenmarkt [Machinery Market]
Maschinenschadem ... Maschinenschaden [Machine Failure]
Mat Consts/Mat Struct ... Materiaux et Construction/Materials and Structures
Mater Eng .... Materials Engineering
Mater Plast Elastomeri ... Materie Plastiche ed Elastomeri [Plastic Materials and Elastomers]
Medd fran Statens brandnamnd ... Meddelanden fran Statens Brandnamnd [Communications from the State Fire Administration]
Med Sci Law .... Medicine, Science and the Law
Melliand Textilber ... Melliand Textilberichte [Melliand Textile Journal]
Min Congr J .... Mining Congress Journal
Minn Fire Chief .... Minnesota Fire Chief

Min Technol ... Mining Technology
Mitt Inst Bautech ... Mitteilungen des Instituts fuer Bautechnik [Communications of the Institute for Building Technology]
Mitt Inst Wasserbau Univ Stuttgart ... Mitteilungen des Instituts fuer Wasserbau der Universitaet Stuttgart [Communications of the Hydraulics Institute of Stuttgart University]
Mod Plast ... Modern Plastics
Naeringsmiddelindustrien ... Naeringsmiddelindustrien [Foodstuff Industry]
Nat Saf News ... National Safety News
Nav Eng J ... Naval Engineers Journal
Nav, ports, chant ... Navires, Ports et Chantiers [Ships, Ports and Yards]
Neftyanik ... Neftyanik [The Petroleum Worker]
Nihon kenchiku gakki ronbun hokokushu ... Nihon kenchiku gakkai ronbun hokokushu [Transactions of the Architectural Institute of Japan]
Not AICAP ... Notizario AICAP [Bulletin of the AICAP]
Nuclear Saf ... Nuclear Safety
Nucl Eng Des ... Nuclear Engineering and Design
Nursing Homes ... Nursing Homes
Oesterr Feuerwehr ... Oesterreichische Feuerwehr [Austrian Fire Service]
Office ... The Office
Offshore Serv ... Offshore Service
Ohm: denki zasshi ... Ohm: denki zasshi [Ohm Journal]
Oper Res ... Operations Research
Packs (Japan) ... Packs [Pakkusu]
Paper Technol ... Paper Technology
PCI J ... Prestressed Concrete Institute Journal
Pediatrics ... Pediatrics
Plaste Kautsch ... Plaste und Kautschuk [Plastics and Rubber]
Plast Eng ... Plastics Engineering
Plastforum ... Plastforum [Plastics Review]
Plast Technol ... Plastics Technology
Polizei Tech Verkehr ... Polizei-Technik-Verkehr [Police and Traffic Safety Engineering Journal]
Polym Eng Sci ... Polymer Engineering and Science
Polytech Tijdschr. Bouwkunde, Wegen en Waterbouw ... Polytechnisch Tijdschrift. Bouwkunde, Wegen en Waterbouw [Polytechnical Journal. Construction, Roads, and Hydraulics]
Powder Metall ... Powder Metallurgy
Power Eng ... Power Engineering
Pozhar delo ... Pozharnoye Delo [Firefighting]
Pozhar okhrana ... Pozharnaya okhrana [Fire Protection]
Prakt Anaesth ... Praktische Anaesthesie [Practical Anesthesiology]
Pr Cent Inst Ochr Pr ... Prace Centralnego Instytutu Ochrony Pracy [Scientific Papers of the Central Labor Protection Institute]
Pribory i sistemy upr ... Pribory i Sistemy Upravleniya [Control Instruments and Systems]
Proc West Pharmacol Soc ... Proceedings of the Western Pharmacology Society
Prof Saf ... Professional Safety
Prom energ ... Promyshlennaya energetika [Indust Power]
Prot Civ Secur Ind ... Protection Civile et Securite dustrielle [Public Protection and Industrial Security]
Protivpozarna Zastita ... Protivpozarna Zastita [F Protection]
Prz bud ... Przeglad Budowlany [Building Revie
Prz poz ... Przeglad pozarny [Fire Revie
PTT Tech Mitt ... Technische Mitteilungen der Schw zerischen Post-, Telephonund Telegraphenbetrie [Technical Information Journal of the Swiss Post Telephone and Telegraph Service]
Publ Pers Manage ... Public Personnel Manageme
R/D ... Research and Developme
Q Rep Railw Tech Res Inst (Japan) ... Nihon Koku Tetsudo Gijutsu Kenkyusho [Quarterly Reports of t Railway Technical Research Institute (published in En lish)]
Radiol Prot Bull ... Radiological Protection Bullet
Rep Fire Res Inst Japan ... [Shobo Kenkyushu Hokok Reports of the Fire Research Institute of Japan
Rep Fire Sci Lab (Japan) ... [Shobo Kagaku Kenky shoho] Reports of the Fire Science Laboratory
Rev Belge Feu ... Revue Belge du Feu [Belgian Fire R view]
Rev Ind ... Revue Industrielle [Industrial Revie
Rev Sci Instrum ... Review of Scientific Instrumen
Rev Tech Feu ... Revue Technique du Feu [Fire E gineering Review]
R Soc Health J ... Royal Society of Health Journ
R Soc Med Proc ... Royal Society of Medicine Proceed ings
Rubber Age ... Rubber Ag
Ryusan to kogyo ... Ryusan to kogyo [Sulphuric Aci and Industry]
S Afr Min Eng J ... South African Mining and Engineering Journal
Sangyo Anzen Kenkyusho Kenkyu Hokoku ... Sangyo Anzen Kenkyusho Kenkyu Hokoku [Research Reports of the Research Institute of Industrial Safety]
Sangyo kikai ... Sangyo kikai [Industrial Machinery]
Sapeur pompier ... [Firefighter]
SBB Nachrichtenbl ... Schweizerische Bundesbahn. Nachrichtenblatt [News Bulletin of the Swiss Federal Railway]
Sb Nauch Tr Leningr Vyssh Inzh Mor Uch-shche ... Sbornik Nauchnykh Trudov, Leningradskoye Vysshee Inzhenernoye Morskoe Uchilishche [Digest of Scientific Papers, Leningrad Advanced Naval Engineering Academy]
Sb Tr VNII protivopozhar oborony ... Shornik Trudov Vsesoyuznogo Nauchno-Issledovatel'skogo Instituta Protivopozharnoy Oborony [Digest of Papers of the All-Union Fire Protection Research Institute]
SBZ ... Sanitaer-Technick, Heizungs—und Lueftungsbau [Sanitary Engineering, Heating and Ventilation Construction]
Schadenprisma ... Schadenprisma [Damage Prism—Journal of Damage Prevention and Research]
Schiff Hafen ... Schiff und Hafen [Ships and Ports]

Schweiz Feuerwehr Z . . . Schweizerische Feuerwehr Zeitung [Swiss Fire Protection Journal]

Science .... Science

Seewirtsch .... Seewirtschaft [Maritime Affairs]

Seisan kenkyu . . . Seisan kenkyu [Monthly Journal of the Institute of Industrial Science of the University of Tokyo]

Seisan to denki . . . Seisan to denki [Production and Electricity]

Sharyo kogaku . . . Sharyo kogaku [Railway Car Engineering]

Sharyo to Denki . . . Sharyo to Denki [Railway Car and Electrical Equipment]

Sichere Arb .... Sichere Arbeit [Labor Safety]

Sicherh Bergbau, Energiewirt, Met . . . Sicherheit Bergbau, Energiewirtschaft, Metallurgie [Safety in Mining, Power Industry and Metallurgy]

Sicherheitsing . . . Sicherheitsingenieur [Safety Engineer]

Siemens Rev .... Siemens Review

Siemens Z ...... Siemens Zeitschrift [Siemens Journal]

Sigurnost .... Sigurnost [Safety]

Soda to enso ...... Soda to enso [Soda and Chlorine]

South Build .... Southern Building

Stahl Eisen .... Stahl und Eisen [Steel and Iron]

Steir Feuerwerbl . . . Steirisches Feuerwehrblatt [Styrian Fire Services Journal]

Str-vo truboprovodov . . . Stroitel'stvo truboprovodov [Pipe Construction]

Sud Med Ekspert . . . Sudebno-Meditsinskaya Ekspertiza [Expertise in Forensic Medicine]

Surg Clin North Am . . . Surgical Clinics of North America

Surg Forum .... Surgical Forum

Tech Mitt . . . Technische Mitteilungen [Technical Communications]

Tech Mod . . . Technique Moderne [Modern Technology]

Technica (Switz) . . . Technica (Switzerland) [Technology]

Technocrat (Japan) . . . Technocrat (published in English)

Tech Ueberwach . . . Technische Ueberwachung [Technical Security Supervision]

Telecomm J Australia . . . Telecommunication Journal of Australia

Telecommun J. .... Telecommunication Journal

Tenside Deterg .... Tenside Detergents

Text Chem Color .... Textile Chemist and Colorist

Text Inst Ind .... Textile Institute and Industry

Text Prax Int . . . Textil-Praxis International [International Textile Engineering]

Text Res J .... Textile Research Journal

Tijdschr watervoor en afvalwaterbehandel . . . Tijdschrift voor watervoorziening en afvalbehandeling [Water Supply and Waste Treatment Journal]

Tokyo daigaku kogakubu kiyo, A . . . Tokyo daigaku kogakabu kiyo, A [Journal of the Faculty of Engineering, University of Tokyo, Series A]

Tr Inzh-ekon Fak Rizh Politekhn In-ta . . . Trudy Inzhenerno-Ekonomicheskogo Fakul'teta Rizhskogo Politekhnicheskogo Instituta [Transactions of the Faculty of Engineering Economics of the Riga Polytechnic Institute]

Tr Vost NII po bezop rabot v gorn prom-st . . . Trudy Vostochnogo Nauchno-Issledovatel'skogo Instituta po bezopasnosti rabot v gornoy promyshlennosti [Transactions of the Eastern Scientific Research Institute for Industrial Safety in the Mining Industry]

Trans AIJ .... Transactions of the AIJ

Uch Zap Azerb in-ta Nefti i Khimii . . . Uchenye Zapiski Azerbaidzhanskogo Instituta Nefti i Khimii [Scientific Papers of the Azerbaidzhan Institute of Petroleum and Chemistry]

Ugol .... Ugol [Coal]

Ugol Ukraina .... Ugol Ukraina [Ukrainian Coal]

Unser Brandschutz . . . Unser Brandschutz [Our Fire Protection]

VDI Z . . . Zeitschrift des Vereins Deutscher Ingenieure [Journal of the German Engineers Society]

Verfahrenstechnik (Mainz) . . . Verfahrenstechnik [Process Engineering]

Versicherungswirtsch . . . Versicherungswirtschaft [Insurance Industry]

Vet Med Small Anim Clin . . . Veterinary Medicine and Small Animal Clinician

VFDB Z . . . Zeitschrift der Vereinigung zur Foerderung des Deutschen Brandschutzes [Journal of the Association for the Advancement of Fire Protection in Germany]

VGB Kraftwerkstechnik . . . Vereinigung der Grosskraftwerksbetreiber—Kraftwerkstechnik [Association of Major Power-Plant Operators. Power-Plant Engineering]

Vopr ekon pozhar okhrane . . . Voprosy ekonomiki v pozharnoy okhrane [Problems of Economics in Fire Protection]

Werkfeuerverband eV. Rundschreiben . . . Werkfeuerverband eV. Randschreiben [Industrial Fire Brigade Association Inc. Circulars]

West J Med .... Western Journal of Medicine

Wiad Gorn ..... Wiadomosci Gornicze [Mining News]

Yuatsu Gijutsu . . . Yuatsu Gijutsu [Hydraulics Engineering]

Yuatsuka sekkei . . . Yuatsuka sekkei [Hydraulics and Pneumatics]

Zem Kalk Gips . . . Zement-Kalk-Gips [Cement-Lime-Gypsum]

Zentralbl Arbeitsmed Arbeitsschutz . . . Zentralblatt fuer Arbeitsmedizin und Arbeitsschutz [Journal of Industrial Medicine and Occupational Safety]

Zesz probl gorn . . . Zeszyty Problemowe Gornictwa [Reports on Mining Research]

Zh Vses Khim O-va . . . Zhurnal Vsesoyuznogo Khimicheskogo Obshchestva imena D I Mendeleeva [Journal of the DI Mendeleev All-Union Chemical Society]

ZS Magazin . . . Zivilschutz Magazin [Civil Defense Journal]

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